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Where?

The following article, under the caption of "Technical Education," appeared in a recent issue of the Chicago *Herald:*

"Readers of the *Herald* frequently ask such questions as 'Where can I study to be an electrical engineer?' A quarter of a century ago there was no such thing as an electrical engineer. There is a growing tendency among young men to go outside the beaten track of the professions and trades. The medical profession is overcrowded, the bar is full, the competition in the regular line of trades is that that kills, and the great opportunities lie in the newer fields of labor. Technical education is becoming the order of the day. Ten years ago, the electrical engineer would have been almost as much out of place as the aerial engineer would be to-day; to-day in this country the sanitary engineer can scarcely find employment; perhaps, in another ten years the builder of the air ship will have found a permanent place in our civilization.

"Nations, like animals, have their changing struggles for existence, and to remain prosperous they must possess the conditions that Herbert Spencer prescribes for individual welfare: 'A constant progress towards a higher degree of skill, intelligence and self-regulation; a better co-ordination of actions; a more complete life.' For the changed and constantly changing conditions of life a mere elementary education is of small value. A scientific education of a higher kind, while better as a preparative, is still insufficient. Between science and practice there is a wide gap, which must be bridged over by men of technical information and special aptitudes. It is not the chief end of a working man to be an ambidextrous ape. Man is proving every day that he was never created for mere handicraft skill in which the ten fingers do work in which the brain has no part.

"The day is passing when industries are taught by apprenticeship, by which a youth could get a good technical education for the work of past periods when the rule of industries was that of the thumb. Industrial occupations are now acquiring the dignity of professions, because they are now based on science. The unscientific modern manufacturer is at a disadvantage. The knowledge of his particular science must be gained at a technical school, which must teach the workmen, the foremen and the managers, the scientific principles underlying the industry. The capitalist does not always encourage such education, but he stands in his own light when he does not. He is awakened to his folly when he sees the labor market changing from places that neglect technical education to those that promote it.

"The true education of the laborer—and all honest men are laborers—is to make him an intelligent being rather than a dexterous imitator and manipulator. A thorough understanding of the principles of his work tends to give him moral dignity and intellectual force. Had Faraday's education been limited to what bore on his manipulative skill as a newsboy or a bookbinder, the world would be far behind what it is now. The proper education of every man is the widest that he can attain; the more he knows the more useful is he to himself and to those around him. Education to be true and complete must fit a man or a nation for a complete life. The education that gives knowledge that is of no use for the activities and duties of existence is useless."

We have carefully read this interesting effusion, but fail to see that the question which inspired it has been answered. We offer the *Herald* our assistance in the matter, by simply repeating our advice to young men about to enter college. "Where can I study to be an electrical engineer?" At a scientific school which supports a good course in electrical engineering. There are enough such colleges to give any man a wide range of choice. After a four or even five years' college course, of which the larger part has been devoted to professional work, and during which time the theoretical side of electrical engineering has received thorough attention, let the embryonic engineer secure a position in the shops of some large electrical manufacturing concern and stay there for a year or two. The pay will be mighty small, the blisters on the hands will be pretty big, the work altogether will be very hard. But at the end of the one or two years, the young engineer will have had experience for which he wouldn't take a good deal of money.

Now, he can go to almost any electrical company, and setting forth his claims in a modest way, be sure of at least a trial. There are plenty of situations for bright and well equipped young men, and the demand is, and will remain for some years to come, in excess of the supply.

Don't get the idea fixed in your mind, that "it's easy enough; anybody can be an electrical engineer." Don't let what you see on the surface influence you too strongly, look deep. We know men who hang electric bells and put in electric gas lighting attachments, besides attending to a regular key making and speaking tube business. These men, some of them, call themselves electrical engineers.

A young man said to the writer the other day: "Do you think I could get a position as assistant electrician in the Brown-Smith Electric Company's shops? I want to learn the business. I am tired of clerking in a carpet store." The advice he received made him satisfied with his carpet store position. Any man with such ideas of the ease of acquiring electrical knowledge had better remain where he is earning money enough for his landlady and not run the risk of such a huge disappointment as is certainly in store for him.

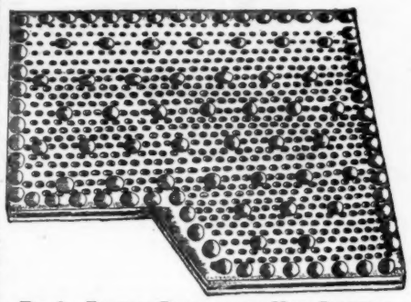

Fig. 2.—Positive Plate of the Main Battery.

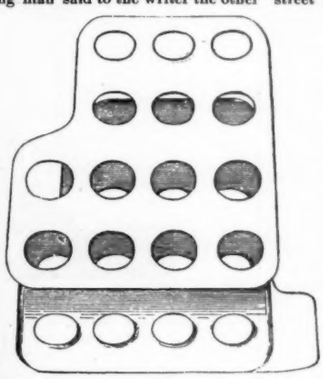

Fig. 3.—Negative Plate of the Main Battery.

The Storage Battery System of the River and Rail Electric Company.

It is the opinion of many eminent electricians that the ultimate motive power for street cars and, perhaps, even inter-urban railroad trains, lies in the storage battery. The advantages offered by the storage battery system are certainly very decided. Every vehicle becomes self-contained and is thoroughly independent of any accidents which may occur at a terminal supply station or on the long lines of supply conductors. For long distance transit, the question of line resistance does not enter into consideration. With these important capabilities in mind, the advent of every improvement in the storage cell or in the instrumentalities by which its energy is applied should meet with cordial approval. The River and Rail Electric Company, of New York, has been working out the details of a storage battery system for the past three years and is now prepared to supply the market with storage batteries which it believes will meet all the requirements of car traffic and will also supply a long felt want in the operation of small motors for domestic or office use. The battery made by this company is constructed in accordance with the patents and inventions of Messrs. Wm. Main and A. V. Meserole, and comprises an acid solution of zinc sulphate, a generating electrode of amalgamated zinc and copper plates riveted together, and a depolarizing electrode of lamillar lead plates perforated with numerous small holes and coated with graphite and bound together by lead rivets. The lead plates are "formed" Plante fashion, the peroxide being integral with the body of the plate as contra-distinguished from the Faure type in which a coating of active material is mechanically applied in the form

Fig. 1.—The River and Rail Electric Company's New Storage Battery Car.

Electric Cabs in Germany.

A system of electric cabs has been introduced in Stuttgart, with a degree of success that promises the permanent relegation of the cab horse to other fields of usefulness. The new vehicles are already popular, though at present their novelty has much to do with the patronage they receive.

of a paste or otherwise. The graphite serves as a capillary separating medium between the several leaves or sheets of the electrode, and thus causes the solution of the cell to reach all parts of the peroxidized surface, thus utilizing every portion of the combined area of all the sheets for depolarization. In charging the battery zinc from the zinc sulphate, solution is electrolytically deposited upon the zinc-copper electrode, while the lead oxide or such portion of the lead plate as is in a condition of sub-oxidation is peroxidized; so that when fully charged the cell becomes a combination of amalgamated zinc, acid and peroxide of lead, yielding a very high E. M. F. We illustrate herewith in Fig. 2 one of the lead elements, and in Fig. 3 one of the zinc elements. It is stated each cell yields 2½ volts. The thorough amalgamation of the zinc and copper prevents local action and the same zinc is used over and over, passing into zinc sulphate in discharging and being redeposited when the cell is charged. It is claimed the batteries do not deteriorate with protracted usage.

This company also makes a motor of its own, a good idea of which may be gathered from an inspection of Figs. 5 and 6. It consists essentially of a fixed iron ring wound with a continuous coil—Gramme style—the sections of the coil being progressively connected to a fixed commutator or collector. The armature is simply two iron Maltese crosses rigidly mounted on a spindle, so that they will lie at the sides of the wound ring. The brushes, of which there are two pairs, are fixed to the spindle and turn with it, thus shifting the polar lines around the ring constantly in advance of the wings of the cross. It is claimed that this type of motor offers great advantages in dispensing entirely with wires or coils on any moving part and in bringing the iron of the armature (or what, strictly considered, should be called the rotating field piece) into close relation to the iron of the ring. Several sizes of these motors are made, the smallest designed to drive sewing machines and the largest for street car work, the intermediate size for light machinery. The motor is compact in form, and can be placed in small quarters.

In applying the motors to traction purposes, the mechanism, as illustrated in Fig. 7, is so arranged that the motor is in motion at a critical speed at all times, and only drives the wheel axles when a clutch is actuated. This offers a great advantage in overcoming the inertia of the car in starting, as the motor does not have to start from a state of rest, but has sufficient momentum to start the car. The clutch is operated by a lever on the front platform of the car, which, as will be understood from Fig. 1, is curved, forming a recess in which the motor man can stand without interfering with the movements of the passengers. The clutch is somewhat difficult to describe without very free illustration. Two portions of the motor shaft have pinions journaled eccentrically, which intermesh at all times with internally toothed gear wheels which surround them. The pinions may revolve idly, or be locked so as to drive the surrounding gears, which communicate motion to the wheel axle by means of a sprocket chain. Lubrification is effected by centrifugal action, the surplus oil being caught in a drip pan and returned to the feed reservoir.

The storage batteries are carried under the car seats, see Figs. 4 and 7, the sides of the car being provided with sliding drawers opening from the outside and nicely adjusted on rollers for convenient movement. A set of charged cells set in a drawer are wheeled to the car upon a truck and slid into place, drawer and all, by simply turning a crank on the truck; they are then locked in position by means of a catch, the entire operation requiring only a few minutes. The containing vessels of the battery are made of hard rubber, those designed for car driving being open at the top. Several sizes of cells are made, however, to meet different styles of service, the smaller ones being closed and sealed at the top so that they can be carried about without danger of spilling the solution. The small cells are mounted in handsome cases. One field of use designed to be filled by them is in the medical applications of electricity; surgeons who use cautery, and dentists or others who want to examine recesses of the *genus homo* hidden from the light of day will find these smaller cells of great assistance.

The office of the company is at Aldrich Court, 45 Broadway, N. Y., where there are all the paraphernalia to demonstrate the efficiency of the several manufacturers.

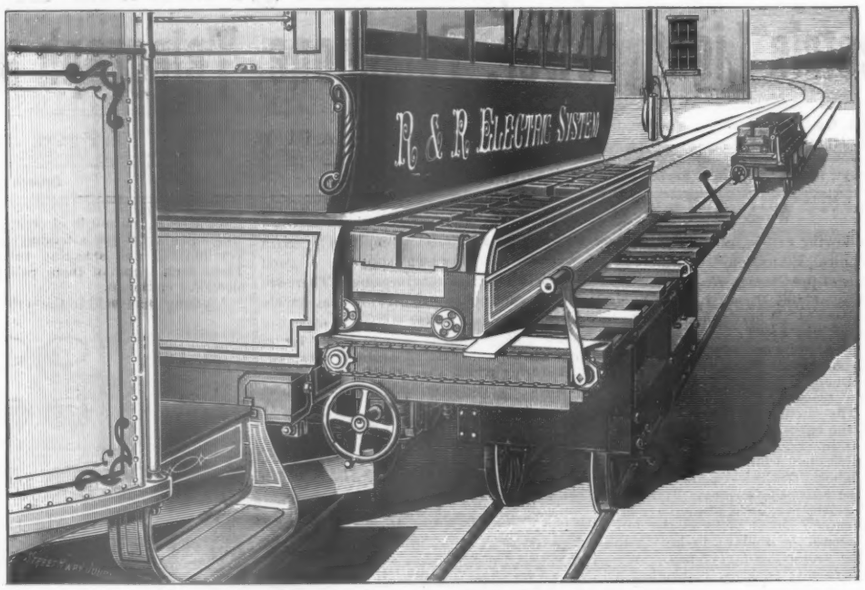

Fig. 4.—Method of Changing Batteries.

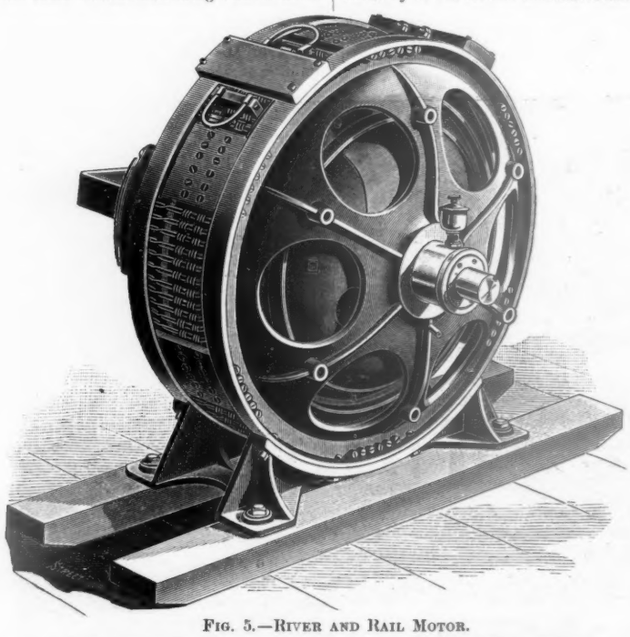

Fig. 5.—River and Rail Motor.

Fig. 6.—River and Rail Motor.

New Power Station of the Wilmington City Railway Company, at Wilmington, Del.

This new station is of the most substantial character. It is a brick building, 43x75 feet, with a slate roof. The adjoining boiler house is 40x40. The steam plant consists of three 150 horse-power Westinghouse compound engines for driving the power dynamos, and one 50 horse-power Westinghouse compound engine driving a separate dynamo for lighting. Steam is furnished from tubular boilers of 500 horse-power capacity. There are six 50,000 watt Edison generators furnishing power to the road, and one 250 light dynamo running several small stationary motors, and lighting the company's offices, which adjoin the power plant. The switchboard is of yellow pine and a very handsome affair, 16 feet square, with all the instruments placed upon it in a very systematic and complete manner. The entire electrical part of this plant is being installed by the Equitable Electric Railway Construction Company, of Philadelphia, under the direction of the Chief Engineer of the Company, Mr. W. A. Stadelman.

—— West Bethlehem, Pa., has resolved to have 18 electric street lights, to cost probably $1,500 a year. The town is in a way forced into this heavy yearly expenditure in its municipal infancy by the brilliant illumination o' nights (till midnight) of its older sisters, Bethlehem and South Bethlehem.

The common council of the city of Mexico, has refused the Mexican Telephone Company privileges of poles in the streets.

Electricity Direct from Work.

The accomplishment of an hitherto apparently impossible feat—the useful transformation of mechanical work directly into electricity—is claimed by Prof. Braun, of Tubingen. He winds nickel wire into spirals, and as each spiral is elongated or compressed, a current of considerable strength is generated. This is increased by putting a number of spirals in parallel. Such positive results are stated to have been attained that the professor is hopeful of being able to construct a practical generator on this principle.

Accumulators with Porous Partitions.

M. Chatiliez, manager of the Verdun water power electrical station, writes that he has met with considerable success by employing ordinary porous partitions between the battery plates. These partitions are fluted to admit of the introduction of the electrolyte and pierced with holes to allow the liquid to circulate, and to diminish the internal resistance. The end plates rest against india-rubber washers. M. Chatiliez states that a series of experiments with these plates have shown that the grids may be made lighter and the perforations larger than usual without detriment. The internal resistance of the cells may be kept within moderate limits by slightly increasing the density of the solution.

The Mechanical Equivalent of Light.

According to Dr. O. Tumlirz, a surface of one square centimetre placed vertically at a distance of one metre from an amylacerate lamp, so that it is normal to the rays, receives in each second a quantity of light, the energy of which is equivalent to a heat energy of

$$361 \times 10^{-9} \text{ calories},$$

or to an electrical energy of

$$(1.226 \text{ milliamperes})^2 \times 1\Omega.$$

Taking this in conjunction with the statement of S. P. Langley that one square cm. of the earth's surface, under vertical incidence of the sun's rays, receives in a minute 2.84 calories, it will be seen that the sun's light can be replaced by 1,020 quadrillion units of light, or 820 quadrillion normal German candles.

Accumulators at the Berlin Telegraph Office.

The London *Electrician* states that in a paper recently read before the Elektrotechnischer Verein, Herr Strecker, chief engineer to the German Imperial Telegraph Department, gave a brief account of the accumulators which had been installed in Berlin in connection with the telegraph service. In October last, a battery of 25 Tudor accumulators, having a capacity of 25 ampere hours, was installed at the Berlin telegraph offices. The cells are charged with a current of 7 amperes by a shunt-wound Siemens machine, driven by a 5 horse-power Otto engine. The current is conveyed to the central office, distant 1.7 kilometre, by means of a 7-wire cable, each wire having 5 ohms resistance. Only 3 wires are at present used, and they convey the current in the following manner: The first, starting from the eighteenth cell of the battery, supplies 36 circuits at 34 volts; the second, starting from the twentieth cell, supplies 12 circuits at 40 volts; the third starts from the last cell of the battery, and supplies 13 circuits at 50 volts, 6 circuits at 60 volts, and 1 circuit at 80 volts. In the 2 last circuits, 10 and 30 primary cells, respectively, are added to the secondary cells. These 68 lines comprise 41 Morse and 27 Hughes circuits. The negative pole of the battery is connected to earth. The average discharge is at the rate of 60 milliamperes, so that the accumulators can supply this from 30 to 40 days, although, as a matter of fact, they are charged every 10 days. The charging is effected in the following manner: The dynamo is switched onto the accumulators through a very high resistance, so that the charging current is at first very small indeed. A wire is taken from the center of the battery to earth through a voltmeter, and when the E. M. F. rises by about 2 volts, the engineer in charge, by means of a switch, switches out a cell from the telegraph circuits, still leaving in it the charging circuits. The charging current is then increased, and as the E. M. F. rises still further, more cells are switched out. The reverse process is gone through on stopping. The difference of potential on the telegraphic circuit during the charging operation is kept so uniform, that no complaints have ever been received from the central office. Since the cells were first employed in the beginning of October, 1889, they have worked in an irreproachable manner, and the authorities are so satisfied with them that they now propose to adopt them on a far larger scale.

At Walla Walla, the electric light and gas company has finished the erection of the new brick power house, and the machinery is on the road. Incandescent lights will be in position by August 1. The dynamo will be capable of supplying 800 sixteen candle-power lights. The company has the assurance that all will be taken.

But Where do the Bugs Get Off?

To the Editor of Electrical Review:

Everywhere the Goddess of Electricity bestows her favors with a lavish hand. Even the little sparrow has not been forgotten. Witness the following from the Los Angeles, Cal., *Times:*

"The wise sparrow no longer wastes time hustling about the streets for a meal. He simply dives into the street electric light globes and dines from a choice selection of 'electrocuted' bugs."

And when the little sparrow retires to his couch under the eaves, blinks at the lamps and reverently chirps "How great and manifold are thy works," he means, of course, the electric light works.

San Francisco, July 9. Amandus.

JEST FOR FUN.

It is no reflection on the builder of the machine to say that a bright man makes a good dynamo tender.

"I can't understand all this fuss about using electricity for executions," remarked Judge Lynch, of Kansas. "Out in our section we have used the telegraph pole for years."—*The Green Bag.*

Young wife—"Then you won't fulfill this trifling request of mine?"

Husband—"Not on any account!"

The wife silently brings out a phonograph, which, on being set in motion, pronounces audibly the following words:

"Dearest Agnes, when once we are married, I will do my utmost to carry out every wish I can read in your eyes."—*Humoristische Blatter.*

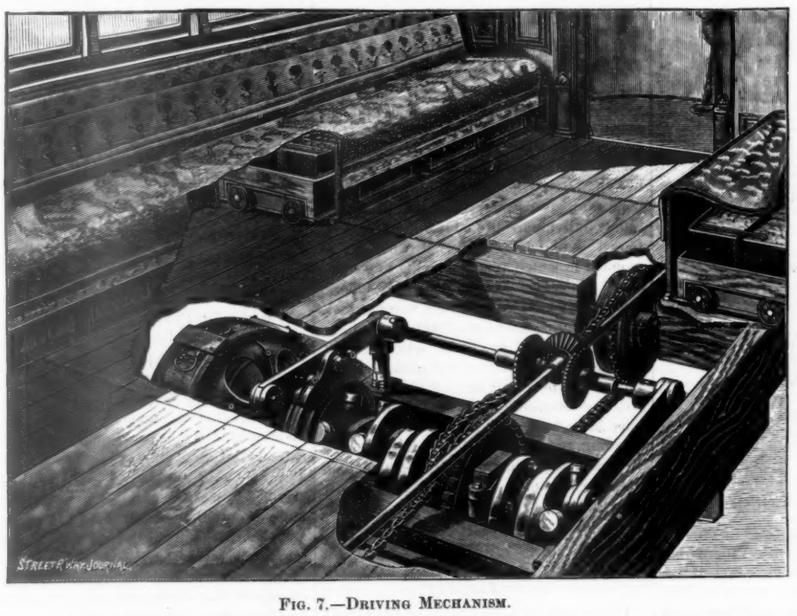

Fig. 7.—Driving Mechanism.

Sugar in Battery Work.

A correspondent writes to the *Victorian Electrical Telegraphic Journal*, as follows: "I became aware of a wrinkle lately that I am confident will be a novelty to many of your readers, and also of use. One of our telegraph inspectors gave it to me. He came to my station and found that the battery was not up to his idea of what a battery should be. He took it down and renewed it When it was put up again he asked me to favor him with a little sugar. Surprisedly I asked him what he wanted with sugar, thinking he had made some mistake. He quietly laughed, and said: 'Get some and I will show you what it is for.' It was got, and he began to wash his hands in the usual way with soap and water; but after rubbing the soap he added the sugar, and immediately a good lather came. He washed his hands twice, and told me to do likewise. I did, and to my pleasure my hands came out of the wash clean and soft. He told me always to do so when working with magnesia or copper solutions, and the nasty dry feeling that usually is experienced when working with a battery is quite done away with."

BOOK NOTICES.

"Report of the Seventh Annual Meeting of the Street Railway Association of the State of New York," gives the full proceedings of the meeting held in this city last September.

"Transactions of the American Institute of Electrical Engineers," contains "Phenomena of Alternating Current Induction," by Prof. Elihu Thomson, and "Electricity in the Navy," by Gilbert Wilkes, both of which have already been published in this journal.

"Experimental Electricity," by Edward Trevert. This is a useful handbook to the seeker after truth in the electrical field. In it are given directions for constructing home made apparatus with which experiments may be performed, and which will give good results.

"Transactions Kansas Academy of Science," vol. xii., part 1, has been received. The proceedings of the twenty-second annual session at Wichita last October are set forth, together with the secretary's reports. Among the many interesting papers is one on "Magnetic Declination in Kansas," by Professor F. O. Marvin, of the State University.

"The Electric Railway of To-Day," by H. B. Prindle, sets forth in a popular manner just what the average man wants to know on the subject. The information is trustworthy and concise, the various systems are fully illustrated, and altogether the book is readable and interesting both to the "outsider" and the electrician. It will prove a publication which will do good missionary work in the street railway field.

"Practical Sanitary and Economic Cooking Adapted to Persons of Moderate and Small Means," by Mrs. Mary Hinman Abel. This is the latest prize essay issued by the American Public Health Association, whose work in caring for the health and comfort of the poorer classes is so productive of good results. The author of the book received the Lomb prize of $500, in competition with 69 other contestants. It is a well written essay, and the subject is scientifically and at the same time practically treated.

Eli Perkins and the Paris Audiphones.

Paris, July 4, 1890.—The most wonderful things in Europe were invented in America.

I refer to the telephone, audiphone, phonograph, telegraph and sewing machine. The French are using both the audiphone and phonograph for business and pleasure.

On the Rue des Italiens there is an alcove room or niche fronting on the street, in which are a dozen public audiphones, each one connecting with a different theatre, variety show or *cafe chantant*. It was crowded with listeners holding the audiphone handles to their ears.

"Who do you want to hear?" asked the attendant, as I entered.

"Give me Sarah Bernhardt!"

"Here she is," he said, handing me the handles for my ears. "Put a half franc (ten cents) in the slot and listen five minutes."

When the time was up, the attendant pointed to another audiphone and said, "You can hear Coquelin there, the Vaudeville here, or the Grand Opera in the corner. Put your money in the slot and listen."

So I listened to plays, songs and operas in six theatres in Paris for half an hour, at the expense of 60 cents. I afterward obtained barrels of a phonograph, on which were recorded these songs and plays and will listen to them again in New York.—*New York Herald.*

Ridley, Pa—The Ridley Electric Light and Power Company, capital, $5,000.

Grand Rapids, Mich.—Grand Rapids Electric Railway Company, capital $400,000.

Dallas, Tex.—Dallas Electric Company, capital stock $300,000; object, to furnish light and power.

Milwaukee, Wis.—The Milwaukee and Wauwatosa Electric Railway Company has been incorporated.

Monongahela City, Pa.—Monongahela Electric Light Company, capital, $40,000. Directors, E. G. Acheson, S. A. Duncan, W. W. Acheson, of Pittsburgh.

Camden, N. J.—Star Electric Company, capital $5,000. The incorporators are, Norman Marshall, Boston, Mass.; John S. Spruance, Camden, New Jersey, and Harry W. Simpson, of New York City.

Chicago, Ill.—Universal Electric Construction Company; to manufacture electrical machinery; capital stock, $500,000; incorporators, Charles M. Peale, Edwin Brainerd and Frederick H. Wood.

Trenton, N. J.—Central New Jersey Telephone Company; capital $150,000. The company is to extend its lines from New York through Jersey City, Newark, South Orange, Springfield, Summit, Washington, Phillipsburg and other places.

Seattle, Wash.—Lake Washington Belt Line Company. The objects are to construct, purchase, equip, maintain, operate, sell, lease and transfer railways, motor lines, electric light plants and water works, and buy and sell real estate. The capital stock is $2,000,000, divided into 20,000 shares.

Kansas City, Mo.—The Edison Electric Company, of Kansas City, has filed a certificate of an increase of its capital stock from $100,000 to $150,000, all paid up. The company also filed a certificate of the assets and liabilities, the former being put at $125,315.96, and the liabilities at $25,213.78.

Fittsfield, Mass.—The Pittsfield Electric Light Company was organized last week, with a capital stock of $100,000 and these officers: President, Alexander Kennedy; treasurer, W. A. Whitlesey; clerk, W. L. Adam; directors, William Stanley, Jr., W. R. Plunkett, C. C. E. Merrill, and president and treasurer.

Quincy, Ill.—The Electric Motor Company has been fully organized by the election of the following officers: President, W. S. Warfield; secretary, James M. Bishop; treasurer, F. W. Meyer. The arrangements to commence work on the track at an early day are progressing very favorably, and in a week or two a large force of men will be at work.

The Sims-Edison Electric Torpedo.

An exhibition of the Sims-Edison mobile electric torpedo was given off Willet's Point, one day last week, before a large number of army and navy officials, and proved very successful. The torpedo was operated from the dock, showed a high speed and obeyed the slightest wish of the operator as to direction.

Chicago to Have a Great Wire Industry.

Chicago, June 30.—The transfers were filed this afternoon of close on 400 acres of land south of the Calumet Iron and Steel Company's mills, at Cummings, the consideration for which will be $385,000. The purchasers are the firm of Washburn, Moen & Company, the great wire concern. Several hundred thousand dollars will be expended on the improvements, and the firm will erect works capable of giving employment to between 3,500 and 4,000 men.

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GEO. WORTHINGTON, - - Editor.
CHARLES W. PRICE, - Associate Editor.
ROBT. H. READ, Manager Patent Bureau.

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Baxter, H. E. & C 22
Blanchard, C. M. 12
Boston Woven Hose Co. 22
Brownlee & Co 18
Buckeye Engine Co 14
Burton Electric Co. 19
Butler Hard Rubber Co. 25
Cary & Moen 24
"C. & C." Electric Motor Co 13
Central Electric Co. 18
Chadbourne, Hazelton & Co 26
Clark Electric Co. 12
Cleveland, W. B. 21
Columbia National Bank 11
Dwight Slate Machine Co. 24
Eddy Electric Manufacturing Co. 25
Edison Machine Works 17
Edison Manufacturing Co. 20
Elektron Manufacturing Co. 13
Empire China Works 19
Empire City Electric Co 26
Eugene F. Phillips Electrical Works, Ltd 12
Eureka Tempered Copper Co. 21
Evans Friction Cone Co. 13
Faraday Carbon Co. 24
Fort Wayne Electric Co. 28
Freeman, Walter K 25
Garvin Machine Co. 14
Gibson Gas Fixture Works 14
Gordon & Co., W. H 18
Great Western Electrical Supply Co. 27
Greeley & Co., The E. S. ..... 12 & 22
Hazazer & Stanley 23
Heine Safety Boiler Co 22
Holmes, Booth & Haydens 21
Holtzer-Cabot Electric Co. 19
Horn, Brannen & Forsythe Manufacturing Co. 26
Illinois Electric Material Co. 25
"Industries" 26
International Electrical Exhibition 19
Interior Conduit & Insulation Co 22
Jarvis Engineering Co. 14
Lane & Bodley Co 24
Leclanche Battery Co. 12
Leffel & Co., James 24
Lehigh Valley Creosoting Co. 12
Macfarlane & Co., Wm. 12
Maguire, F. Z. 11
Manufacturer 11
Marshall, Wm. 11
Messner, C. W. 11
National Carbon Co. 19
Newark Machine Tool Works 12
New England Butt Co. 14
New York Belting and Packing Co. 24
Ostrander & Co., W. R. 12
Palermo Mica Co. 24
Parker-Russell Mining and Manufacturing Co. 24
Phœnix Glass Co 12
Phosphor-Bronze Smelting Co., Ltd. 19
Pond Engineering Co. 14
Powell Co., The Wm. 21
Queen & Co., James W. 12
Rice Automatic Engine 14
Royce & Marean 24
Santley & Co., W. R. 22
Sawyer-Man Electric Co. 27
Schuyler Electric Co. 26
Seely & Taylor Manufacturing Co. 22
Shultz Belting Co. 14
Southern Electrical Supply Co. 13
Sperry Electric Co 22
Sprague Electric Railway & Motor Co. 19
St. Louis Electrical Supply Co. 23
Stevens & Babcock 25
"Street Railway Journal" 23
Thackara Manufacturing Co 21
Thomson-Houston Electric Co. 14
Trinidad-Heimann Insulated Wire Co. 19
United Electric Traction Co. 18
Vincent & Co., Charles R. 14
Wainwright Manufacturing Co. 28
Walker Electric Co 18
Wanted—Electrician 11
Wanted—Electric Light Salesman 11
Washburn & Moen Manufacturing Co. 24
Washington Loan & Trust Co. 11
Washington Electric Conduit Co. 11
Watson & Stillman 12
Western Electric Co. 24
Western Power Construction Co. 21
Westinghouse Electric Co. 16
Whipple Co., The Fred H. 23
Williams & Potter 14
Wyckoff Pipe Co. 12

These are the days the electric fans carry off the honors.

The remarks of Mr. Henry Villard that he had good reason to believe that in five years the steam locomotive would be supplied by electricity, have attracted much attention. And yet we do not think that many stand ready to dispute the possibility, or rather probability, of such a development of electric power.

During the evenings of two days last month, beautiful exhibitions of Aurora Borealis were observed, shortly after sunset, by the inhabitants of Vera Cruz. On one occasion, well defined bands of blue, white and violet light were seen in the sky. No mention is made of any electrical disturbances on the telegraph wires accompanying these celestial displays, although such effects are generally observed to be coincident with the appearance of the Aurora Borealis.

Reports have reached us from France that Messrs. Berthoud-Borel, manufacturers of electric light wires, are making a new type of cable insulated with layers of celluloid tape; above the tapes a serving of hemp is put on and the whole cable is plunged in a bath of hot liquid insulating compound. Electrical conductors were covered with celluloid some years ago in this country, but only as an experiment. The cost of insulating wires with celluloid is so much greater than that of gutta-percha or the other well known American brands of insulation, that the process would not, it is thought, at present be commercially successful.

A Denver suburb, now soliciting a boom, is called Electric Heights. The projectors of the scheme have evidently realized that most anything connected with electricity, even if only in name, is sure of progress.

The purchase of the Okonite Company is the first venture, we believe, made by English capital into electrical circles on this side. It is evident that our English brothers know a good thing when they see it and if all their investments in this country are made as wisely, not only in respect to the undoubted value of the property, but also in retaining the former successful American management, they will have reason to be congratulated, and their investment with us will be heartily welcomed.

Mr. R. F. Ross has purchased the interest of Col. C. M. Ransom in *Modern Light and Heat*, and will hereafter conduct that well-known Boston journal as editor and manager. We expect to see Mr. Ross, under the pressure of this increased responsibility, continue and advance the success of his journal, giving it the full benefit of his untiring energy, ability and years of newspaper experience. Col. Ransom has many friends in the electrical field who will regret to lose him. The REVIEW most cordially wishes him well wherever his work may be hereafter, and is pleased to learn of his improved health, after a severe illness of several months.

Judging from the following paragraph, extracted from a Mexican daily paper, published at Jalapa, the equipment of telegraph offices in those parts must be carried out in a peculiar manner: "The ground wire of the telegraph office in this town is laid along the flagging of the sidewalk in such a manner that it is constantly trodden upon by passers-by. Some day, perhaps, an unfortunate individual—probably one going barefooted—will tread upon that wire at the moment in which it is conveying to ground one of the frequent discharges of atmospheric electricity which the telegraph wires attract, and the consequences are likely to be disastrous. It would surely be better to insulate the wire in question and solder it to the rails which pass near by." *La Revista Telegràfica de Mexico* believes that this paragraph must have been evoked by some misunderstanding, not thinking it possible that any Mexican telegraphist would commit such an unpardonable piece of stupidity as to allow a ground wire to be placed along the surface of the public sidewalk.

METAL CHAINS AS CONDUCTORS OF ELECTRICITY.

It is well known that metal chains have a high electrical resistance, owing to their numerous points of contact, and also that the resistance of a chain diminishes as the tension is increased. Du Moncel noticed and described this effect in 1850, and Reynier made use of the principle by constructing a rheostat consisting of a chain which could be subjected to a varying tension.

Herr F. Uppenborn, the well known German scientist, recently made a series of observations with a brass chain having circular links in order to determine its resistance under different strains. The chain was suspended vertically, and weights were attached to the lower end. The resistance of the chain hanging free was found to be upwards of 10,000 ohms; on applying a weight of six kilograms, this fell to 47 ohms, while twice this weight reduced the resistance to 18 ohms. With 16 kilograms, a further reduction of 8 ohms was observed, and with 2 kilograms, the resistance was only slightly above 2 ohms. Finally, when supporting a weight of 5.1 kilograms, the chain showed a resistance of only 1.2 ohms.

The fall in resistance is very sudden at first, as immediately on applying a weight to the chain all the points of contact are brought more closely together. After attaching two kilograms, however, the resistance decreases much more slowly, as three kilograms additional only effect a difference of about $\frac{8}{10}$ of an ohm.

THE WESTERN UNION FIRE.

Probably no single disaster could so thoroughly affect the country at large as the Western Union fire. The immense building at Broadway and Dey streets might be called the heart of the metropolis, and the wires to all parts of the world, the arteries and veins, through which is supplied the blood or news by which business and the daily actions of the people are in a great measure influenced. The Stock Exchange operators, for the time being, had to practically suspend trade. The Associated Press and the other news bureaus were badly crippled. The newspapers felt the blow the most keenly. Many of them, however, had recourse to the long distance telephones. Correspondents in distant cities were placed in communication with representatives here, and the news was transmitted "by word of mouth."

The Western Union officials were prompt in establishing temporary offices, and messages were sent subject to delay. General Manager Eckert and his assistants are deserving of great credit for getting things in shape in such short order. It will be some little time before the heart begins to beat and the blood to flow in the normal way.

BRITISH TRACTION.

We have occasionally referred in these columns to the laborious efforts of that powerful young branch of electrical industry—electric traction—to establish itself permanently in England. The news received for the past few years has generally been of some experimental line started in an obscure section of the country, and more often than that, after the first intimation, the experimental lines have never been heard of again. Owing to the very natural prejudice which exists in England against the placing of poles and overhead wires in towns and cities, our British cousins have been restrained to the use of accumulators, and up to the present accumulators leave much to be desired for traction purposes.

The latest information from the seat of war is of a diversified nature. The Elieson system, the main features of which are the employment of a separate truck or engine containing the motor and accumulators to haul the car, has received a severe set-back owing to the abandonment of it by the North Metropolitan Tramway Company, after an extended trial of the system on its lines. The action of the railway company was ascribed to a series of mishaps which have lately occurred to the motors and engines, and these accidents have been the cause of a lawsuit between the Elieson Company and Messrs. Crompton & Company, who had charge of the works and operation of the line for a time. Such an unfortunate state of affairs must undoubtedly tend to prejudice the public, and especially the investing section of it, against electric traction, let the system be what it may.

There is a brighter side to the picture, however. The General Electric Traction Company has recently been formed with an influential directorate and large capital, and controls the Sprague and Julien systems, the former of which has been so successful in this country. Another company is about to ask for a capital of a million sterling for the development of electric traction on the Thomson-Houston and series systems. This company is said to have already made a number of important contracts for the equipment of surface railways in various parts of the country, and expects also to find a promising field in heavier railroad work. So it would appear that the outlook for electric traction in the old country is very promising just now, and we hope soon to hear of good work being done and solid results obtained.

La Revista Telegràfica de México states that the Mexican Telephone Company has petitioned for an extension of 10 years in their franchise allowing them to run overhead wires in Mexico City, but that the political press of the capital is unanimously opposed to such extension being granted, and that public feeling runs very high in the matter.

CORRESPONDENCE.

Electrical Happenings in Boston and Chicago.

OUR BOSTON LETTER.

Mr. M. E. Baird, of the Eddy Electric Company, was in this city this week and favored this office with a visit.

Distinguished Visitors.—General Warner, of Ohio, and Prof. Gray, of the Rose Polytechnic Institute, of Indiana, were guests on Wednesday of Messrs. Thomson and Rice of the Thomson-Houston Electric Company.

Off for Alaska.—President H. A. Pevear, of the Thomson-Houston Electric Company, with Mrs. Pevear, his son, H. T. Pevear and wife, and Mrs. T. F. Bancroft and daughter, start Saturday on a trip to Alaska.

President J. M. Allen, of the Hartford, Conn., Steam Boiler Inspection and Insurance Company, has been elected a member of the American Academy of Political and Social Science, recently organized in Philadelphia.

Mr. A. T. Starkey, general manager of the Sprague Electric Railway and Motor Company's Railway Department, was in this city recently on business for the company.

Mr. P. A. Dowd, formerly Boston agent for Sprague Electric Railway & Motor Company, and recently New York agent for the same company, has been made New England agent of the Wenstrom Dynamo and Motor Company, of Baltimore, Md.

Mr. James R. Magee, the affable and indefatiguable manager of the Thomson-Houston Electric Company's Isolated Department, reports as follows: "That as compared with the first six months of last year the business for the same period this year shows an increase in the sale of incandescent lights of nearly 300 per cent., and that there has been sold through this department nearly four times as many arc lights during that period."

Big Chimney.—The Narragansett Electric Lighting Company, Providence, R. I., is erecting an immense chimney at its new works. The stack has already been raised 164 feet, and will be continued until it reaches a height of 250 feet, when it will be the tallest chimney in Rhode Island. The work of construction was begun last year and will probably be completed in about four weeks. Over 1,500,000 bricks will be used before the cap is set in place.

Mr. J. W. Howard, formerly identified with the Walter T. Glover Company, Manchester, England, manufacturers of electric cables, has entered into partnership with his brother, Mr. H. A. Howard, of this city, the popular New England agent of the "C. & C." Motor Company.

The Wainwright Manufacturing Company, of Mass., reports recent sales of feed water heaters, as follows: Plymouth Electric Light Company, 250 horse-power, Plymouth, Mass.; Schuyler Electric Light Company, 150 horse-power, Middletown, Conn.; Stillwater Electric Light and Gas Company, 150 horse-power, Stillwater, Minnesota; Waltham Gas and Electric Light Company, 300 horse-power, Waltham, Mass.; Electric Light Department, 400 horse-power, City of Easton, Pa.

Mr. W. J. Clark, of the Thomson-Houston Electric Company's railway department, leaves Boston for Denver, Col., this evening, and within a fortnight he will visit Texas, where he expects to remain for some time. Mr. Clark is quite enthusiastic over the success of the electric railway at Denver, which was constructed and equipped a few months since, under his (Mr. Clark's) personal supervision. "The road in question," said Mr. Clark, "has 12 motor cars and five 'trailers' in active service which are said to accomplish more work and carry more people than was done by the 72 cable cars previously run on the same railway."

Messrs. Claflin & Kimball, the New England agents of the Mather Electric Company, of Manchester, Conn., report having taken an order from the Waltham, Mass., Watch Company for an increase of 1,000 incandescent lights in dynamo capacity, making a total of 4,200 lights; this making, when installed, it is said, the largest isolated plant in New England. The Evans Friction Cone System of driving the dynamos direct from a counter shafting will be used. Messrs. Claflin & Kimball also report having closed a contract for a 1,000 light Mather incandescent plant at Swift's Packing Company's establishment, at Cambridgeport, Mass.

The New Haven Electric Light Company expects to move into its new building on Mill River near Grand street, about November 1. All the arc light dynamos and other machinery will be transferred there. About 1,000 piles will be driven as a foundation for the structure. Three new 200 horse-power Green compound and condensing engines will be put in, using the tide water for condensing and city water for evaporation. There will be also three new 200 horse-power Babcock & Wilcox water tube boilers.

The New Telephone Building.—The new building of the Bell Telephone Company will ultimately be occupied entirely by the telephone companies. The company will put in a switchboard in the upper story of the building costing some $300,000, and it is necessary that the company should have absolutely a fireproof building and control the rights of tenants. There are at present 2,500 stockholders in the Bell Company, and the number is constantly increasing. The long distance telephone work progresses slowly, as only skilled labor trained in this field can be employed in construction.

Electric Stocks.—Boston quotations, at closing hour of the Exchange, Saturday, July 19, were as follows:

Thomson-Houston Electric Co.	55⅝.
" " Preferred.	25¾.
" " Series C.	13.
" " Series D.	7¼.
Thomson Electric Welding Co	235.
" European Welding Co.	107.
Westinghouse Electric Co.	38¼.
Fort Wayne Electric Co.	13.
Eastern Electric Cable Co.	70.
" " preferred.	52½.
Gethins Electrical Manufacturing Co.	2⅝.
Union Electric Car Co.	3.
Electrical Safety Co.	1.
Western Union.	83¼.
TELEPHONE:	
American Bell.	230.
Erie.	51.
New England.	54¼.
Mexican	1.05
Tropical American.	1.25

Boston, July 19, 1890. W. I. B.

OUR CHICAGO LETTER.

The Great Western Electric Supply Company have closed a contract with the Lindel Street Railway Company, of St. Louis, Mo., for the supplies needed in equipping their road. Among the orders already sent in on the above contract is one for 10 miles of 00 Simplex wire. The above company have just placed in their spacious show rooms two beautiful electroliers. They are known as the "Elk head." The largest of the two is composed of three elk's heads surmounted by the antlers, each horn tip holding an incandescent lamp and shade, the necks of the three animals meet at a common center, while the whole is suspended from the ceiling by a large brass tube together with ceiling ornaments. The three head electrolier contains 34 lights, while the single contains 16.

The Thomson-Houston Electric Company have closed a contract to equip an electric railway in Quincy, Ill.

The Western Office of the "C. & C" Motor Company has been placed in the hands of Messrs Cummings & McDougall, who succeed Alex. Lewis, lately resigned. The business office of the company will still remain in the Rookery, room 525. Everything points to a rapid increase in the company's western business.

The Sprague Electric Company have secured a contract for equipping an electric railway in Fort Scott, Kansas.

Mr. Harry A. Noyes has been appointed manager of the Electric Club, in place of Mr. Collins, who recently resigned.

H. M. Lufkin, of the "C. & C." Motor Company, was a recent visitor in the city.

Work is Progressing rapidly on the Cicero & Proviso Electric Railway, and Chicago will soon be the proud possessor of an electric road.

The Electric Merchandise Company report business rapidly on the increase and they have recently closed a number of prominent contracts for the equipment of electric roads.

C. E. Wilson has resigned his position as electrician of one of the Chicago City plants and will enter on his duties as traveling representative for the Knapp Electrical Works, August 1st.

The Illinois Electric Material Company will soon place a new incandescent snap switch on the market. The switch is without doubt one of the simplest yet produced, and is the invention of Mr. C. E. Wilson. A description of the switch will be given in a later number of the REVIEW.

The Knapp Electrical Works will soon place on the market a device for cutting lights or motors in or out, irrespective of their position in the circuit, at any desired time and without the aid of any additional wires. The device is controlled and operated from the switchboard in the station. This switch will fill a want long felt by lighting and power companies and will overcome the necessity of operating separate machines for different time circuits. A full description of this device will be given in a subsequent issue of the REVIEW.

The Western Power Construction report the sale of 1,200 horse-power in engines and boilers within the past 30 days, which dates back to the organization of the company. Each of these contracts call for a complete steam installation. The company also have a large number of contracts in sight.

The Engines for the Wisconsin Central Depot have arrived and are now being set up; the plant will start within 30 days.

Chicago, July 19, 1890. D. B. D.

It is proposed to consolidate the Abington & Rockland Electric Light and Power Co. with the one already operating lights at Whitman, Mass.

PERSONAL.

Mr. Chas. G. Armstrong, of the Great Western Electric Supply Company, Chicago, is looking into electrical matters in the East.

Mr. B. E. Sunny, the able Chicago manager of the Thomson Houston Electric Company, was a visitor to the East last week.

Stephen E. Barton and R. F. Ross were visitors from the Hub last week, and were privileged to witness the Western Union fire from their rooms in the Astor House.

Hon. J. G. Slonecker, of Topeka, Kan., the moving spirit of the Topeka Rapid Transit Company, is visiting the East, where original package questions do not vex his mind.

Superintendent W. J. Cole, of the Southern Bell Telephone Company, came in from Atlanta, Ga., last week, and is spending a few days in New York looking into underground matters.

While E. H. Johnson, president of the Interior Conduit Company, of New York, and his wife were being driven to the depot at Greenwich, Conn., one day last week, the horse ran away. Mrs. Johnson was badly hurt and the coachman was fatally injured.

Mr. C. L. Olds, of Fort Wayne, Ind., manager of the Star Iron Tower Company, of that city, was a visitor in New York last week. The tower work in electric lighting is again on the increase, the height of the towers running from 100 to 150 feet, instead of 250 feet, as in the early days of tower lighting.

The Opinion of a Cold Water Expert.

More deaths occur from cold water every Summer than from electricity all the year round.—*Frank Ridlon.*

It Burns Their Noses.

Electricity is offered to the lion tamer in the form of a light wand with an insulating grip for the hand, connected by a flexible wire with a battery of which the power can be varied at will. An experiment with this form of applied science is said to have been successfully made.

The Edison Convention.

The annual convention of the Association of Edison Illuminating Companies will be held on some convenient day in September to be hereafter announced. The meetings of the convention will be held at the West Hotel, Minneapolis, Minn. This will afford the members of the association an opportunity to attend the Minneapolis Industrial Exposition, which opens August 27th and continues during September.

The Westinghouse Electric Company's Railway Work.

The first electrical equipment turned out by the Westinghouse Electric and Manufacturing Company was put in operation on the Pleasant Valley road, Pittsburgh, Pa., on July 4th, and has been in daily operation ever since without a hitch of any kind.

The motors heretofore made for street railway purposes have required the use of wrought iron pole pieces. The motor made by the Westinghouse Company, however, does not require wrought iron pole pieces. Its principal part is a strong and rigid cast iron frame which carries the bearings and pole pieces. The gear wheels and pinions have broader faces than those heretofore made; in fact, everything about the apparatus indicates strength and reliability. The caps for the bearings and the pole pieces are arranged so that the armatures, coils and field magnets can be conveniently removed for the purpose of repairs, and there is used an electric governing apparatus of novel construction which seems to possess advantages over all forms heretofore tried.

To protect the gears from rapid wear and to deaden the sound, it is proposed to surround the gear wheels by a cast iron dust-proof box, which will contain a sufficient amount of oil to keep the teeth of the gears constantly lubricated. This lubrication will lessen the friction and the noise, and the box which will surround the gears will so far deaden the sound as to make it unobjectionable. Street railway officials generally are expressing the hope that some way may be found for transmitting the motion from the motor to the car axle without the use of gear wheels, for the reason that they are not only troublesome on account of the noise, but because the rapid wear involves heavy expenses for repairs.

ANOTHER FROM OUR WASHINGTON CORRESPONDENT.

HE VISITS FORT WAYNE AND FINDS MANY ELECTRICAL MATTERS OF INTEREST IN THAT PROGRESSIVE CITY.

FORT WAYNE, IND.

This is a Very Busy City, and one of the busiest establishments in it is the factory known, officially, as the headquarters of the Fort Wayne Electric Company, but which is best known to many readers of the REVIEW as the place where McDonald and Slattery, and their associates, have originated and prepared for public use so many valuable inventions. The signs of the times are that an additional number of important inventions will soon be brought out by these gentlemen, but, as it is not their custom to make premature announcements, details are omitted here. Storage batteries and alternating current motors are receiving a good deal of attention just now. Mr. McDonald is absent securing contracts for new lighting stations, and Mr. Slattery is also out of the city engaged in making some special experiments. Meanwhile, the business goes forward under the direction of Mr. Chas. B. Fitch, the superintendent, and Chas. S. Hilton, the master mechanic. In the various departments of the factory, 300 employés are hard at work on new apparatus required to fill orders already on file. One of the noticeable things under way is the immense alternating dynamos designed to supply 3,000 sixteen candle-power lamps each. A number of these are nearly completed, and preliminary tests indicate that they will exceed the estimated capacity by at least 500 lamps. The excellent facilities for the manufacture of smaller as well as larger machinery, as shown by the superior finish of the various testing and measuring apparatus which can properly be called instruments of precision, are clearly shown. The company has just closed a contract for the construction of a new building, 50 by 150 feet, three stories high, to be completed in 90 days. This will be used in place of the Brooklyn factory, which is to be transferred to this city. The company is now reconstructing the plant of the Louisiana Electric Light Company, at New Orleans. The station is being remodeled and enlarged, and will be equipped with the new Wood arc light and the Slattery alternating machinery. It will have five of the Slattery 3,000-light dynamos and, when completed, will be the largest central station in the country. Very large orders are being filled for Detroit and St. Louis.

The Electrical Directory for 1890 will be issued in September. The Star Iron Tower Company's editor expected to have it ready for distribution by time of the National Electric Light Association's meeting, in August, but the great increase in electrical industries during the past year, and the consequent large addition to the work have rendered the delay unavoidable. The new volume will contain the addresses of three times as many street railroad companies and nearly twice as many lighting companies as the directory for 1889 did. It will show an extraordinary increase in the use of alternating current incandescent lighting from central stations, as compared with the use of low tension direct current systems. Data collected for the directory also show that, especially in the New England States, the business of consolidating gas and electric illuminating companies has made great advances during the year, and that while the use of gas for illuminating purposes has fallen off, the loss has been more than made up by the quantity used for heating. The publishers have decided not to print the report of the proceedings of the convention this year, but instead of this will give formulæ and special information of interest to central station managers and superintendents.

The Local Lighting Company is preparing to equip its station with the Fort Wayne Company's Wood dynamos, to replace the Jenney machines, which have been in use for a number of years. The arrangement for lighting the city by means of single arc lamps distributed about the principal streets, and tower lights for the suburbs, has proved very satisfactory, and is being gradually extended.

The Street Railway Company, which is operating 10 miles of road, is convinced that electricity is the only suitable power for its use, and would dispense with horses without delay were it not for legal obstacles. The State courts have decided that the act authorizing the incorporation of street car companies permits the use of horse power only, and until the law is changed nothing will be done. It is understood that the legislature, at the coming session, will amend the law so as to allow street railways to be operated by electricity or cable. G. C. M.

Fort Wayne, Ind., July 9, 1890.

Telephonic News

⁂ There are 1,400 telephones in use in Grand Rapids, about one to every 50 inhabitants.

⁂ The badness of the telephone service in London educes an instructive comment from our esteemed contemporary, the *St. James' Gazette:* "There is one change, however, which would not improve the service, and that is for the government to take it over. The telephone would at once become stationary, like the telegraph." This scarcely affords much argument for making the change suggested here in this country.—*New York Sun.*

The Rotation of the Plane of Polarization as a Measure of Current.

In 1851, Wiedemann discovered that if a tube containing bisulphide of carbon is surrounded with a wire carrying a current, the rotation of the plane of polarization is exactly proportional to the strength of the current. Starting from this point, M. d'Arsonval has devised a very simple arrangement for measuring currents and testing the accuracy of ammeters. In the apparatus recently shown to the Société de Physique, a coil of wire was wrapped round an ordinary saccharimeter tube containing pure water or bisulphide of carbon. The E. M. F. of a single Leclanche cell will cause a rotation of one degree. The apparatus can be made as sensitive as one pleases, since for a given current the sensibility depends simply upon the number of convolutions of the coil.—*London Electrician.*

The Paillard Non-Magnetic Watch Company.

The above company is now located in the new Corbin building, corner of Broadway and John street, New York. Mr. W. W. Hammond, secretary of the Peoria Watch Company, is president of the company; Mr. Chas. P. Bruch, secretary and treasurer, and Mr. A. C. Smith, general selling agent. The announcement sent out, part of which appears below, shows that the new company appreciates the value of this important invention, and we predict the time will soon come when the electrical worker who is without one of these watches will be hard to find.

The company's announcement is as follows:

"By order of the Supreme Court of the State of New York, the Non-Magnetic Watch Company of America was dissolved and a receiver appointed to liquidate its affairs. As is well known to the trade, that company had, at the expenditure of many hundreds of thousands of dollars, organized, and equipped factories for the manufacture of watches and watch movements containing the inventions of Paillard; these watches have obtained so high a reputation among the trade that no reference to them is deemed necessary. Upon the abandonment of its business by the Non-Magnetic Watch Company of America, for reasons which are of no general interest except that they are in no way connected with the success of said inventions, the Paillard Non-Magnetic Watch Company was organized under the laws of the State of Illinois for the purpose of continuing the manufacture and sale of non-magnetic watches containing Paillard's inventions. This company has purchased from the manufacturers the movements in process of manufacture at the time of the suspension of the Non-Magnetic Watch Company of America, and has acquired the manufacturing facilities formerly possessed by that company. The movements to be placed upon the market by the Paillard Non-Magnetic Watch Company will be manufactured by the same factories, contain the same inventions and be practically the same as those heretofore sold by the Non-Magnetic Watch Company of America. New grades will be added from time to time as required.

"The Paillard Non-Magnetic Watch Company are licensees under the Paillard patents and no other organization possesses the right to use them. The factories having passed through the experimental stage, all movements sold by this company will be of the newest models and contain the latest improvements. Every movement is warranted and prices guaranteed."

A LETTER FROM MEXICO.

LIFE IN THE MEXICAN CAPITAL, AS SEEN BY A FORMER NEW YORK TELEPHONIST —THE PECULIARITIES OF "CENTRAL."

All the heights and depths of Mexican life—especially the latter—have been mine, and I can give you some information which I hope will prove interesting. There are not many giddy heights of intoxicating enjoyment of life to be realized in Mexico, though I would not have you think I am only longing for the time to be mine when I shall return to the United States. I should like to go back, for I confess your country cannot be compared to this for pleasant privileges and experiences so dreadfully lacking here. The city is very nice to live in, but one misses that stimulating effect which association with advanced people brings with it, and the many sources of pleasure and profit which Northern civilization has following in its wake. The social pleasures of the city amount to nothing. The English speaking people, some of them, are very nice, but many of them do not amount to a great deal. If one would not mind the absence of congenial and elevating association very much, one would like Mexico, but the people are behind the average genteel householders of Brooklyn or New York in intellectuality and refinement, with all their nice little considerations. There may be some exceptions, of course, but their influence is in the minority and not greatly felt. I may change my mind on this after I have been here for some time, but I doubt it. I have been here some four months under the most favorable opportunities for enjoying all that is going on, and really the whole thing has amounted to but little. We have no good preachers, no lectures, no theatrical efforts, no concerts, no newspapers, and yet many people like Mexico. Of course, we have apologies for all these, but they are fourth rate compared with yours, and only make one weary. To an aspiring mind and a nature for intellectual feasts, this country is a Sahara. If one has not these better tendencies, he can settle down into a quiet, easy going, indefinite existence and feel that the conditions of the country, its charming climate, its lazy, peculiar people are interesting and pleasing, and there stop. And that is about all many of the people do here. Simply enjoy themselves—a sort of bodily enjoyment—and nothing more. It is easy to live here. Nature is lavish in her goodness regarding products and happy blue skies, and one can quickly settle into a careless, independent, don't care condition, that is terribly opposed to the advancement and benefit of the higher side of life. The northern steel of high and quickening civilization has not yet pierced the Mexican spirit, and will not for many years. You will think me starting in rather philosophically, but, nevertheless, these things force themselves on one. The people, that is the better class, have not that ability nor facilities to entertain to such a perfect degree as can be done in the North.

I have become acquainted with the people and their customs and so on, and feel quite at home, but, just the same, I often have a longing for the old life. I have my own little Mexican pony, and every morning at 6, go out for a canter of two hours. He is a splendid fellow, perfectly trained, reliable, and can pass anything on the Paseo racing. This morning I enjoyed a most delightful ride, going out on one of the many beautiful drives which the city has, far into the Valley, which is now so verdant as the rains begin. I did not let any grass nor anything else grow under the horse's feet, but fairly flew through space. It is simply charming to obtain a perfect view of the Valley. The other Sunday, several of us climbed the many winding steps of the ponderous old Aztec cathedral, to see this view, and were not disappointed.

All about were lofty mountains encircled with that "purple etheral air" poets love to rhyme about; to the northeast some 40 or 50 miles distant rise in startling distinctness the volcano Popocateptl, 17,500 feet high, and its companion, about 17,000 feet high, Ixtlacihuatl, meaning "Woman in white,"—it might mean almost anything to a foreigner's mind, I guess, if he attempted to pronounce it properly. Both of their summits are gloriously crowned with ice and snow, reflecting always strongly the sunshine, of which latter we have little cessation. To the southwest is Chapultepec, where the present President of the Republic resides five months during the year. Around the castle are most beautiful grounds, comprising a profuse display of flowers, several fine monuments to the departed valiant soldiers, and a most enchanting grove with immense cedar trees always in green foliage, from which is hanging that picturesque and fascinating Spanish moss. To the north, Guadalupe, with its church cut almost in the solid rock of the mountain and its figure of a ship formed from the same hard material, a monument of the thankfulness of a party for the safe delivery from a terrific storm while they were voyaging on the ocean, during which they vowed to have such an erection as an enduring symbol of their gratitude to Deity. At least, that is the way the legend runs, according to my information, which, at the best, is somewhat unsatisfactory. Lake Texcoco follows next, its surface of some eight miles by three glistening with diamond ripples as the sunlight catches the dancing wavelets and bestows a kiss of silver brightness. (Please credit me with this at extra editorial rates.) While the eye is reaching out for points of distant interest, it is pleasantly supported and relieved by the peaceful, quiet life and scenes in the Valley proper—the city with its leisurely moving citizens; drivers of drays and street cars with as leisurely moving mules attached; the quaint architecture throughout of heavy piled domes and rounded buttresses, of churches, blackened with age; the even, almost monotonous, rows of gray, heavy stoned buildings, some with flat roofs sporting a flower bed or two, and little Mexican children tumbling about; around the city the small villages of Tacubaya, Mizcoac, San Angel, and the whole country liberally dotted with knolls of tropical trees and cactus plants and covered with green grass. This is all very beautiful, and few can gaze upon it except in a spirit of delightful contemplation.

The climate is simply charming, and all that one could wish. The altitude being some 7,500 feet above the sea, we are assured of a light, clear air, quite exhilarating to breathe, a temperature never so warm as to cause much perspiration nor so cool as to make an overcoat indispensable except, perhaps, in the early morning and late evening, when the thermometer descends 15 or 20 degrees. At these times, the lower class of natives go about with a blanket wrapped about their bodies, a portion of which is made to cover their mouths, to keep out any bad airs that may be prowling about to liberate the Mexican soul for a flight into regions of bliss. There is not much sense in their doing this, in my opinion, if they would only breathe through the channel that the Creator gave them for that purpose, namely, their nostrils, and not through their mouths. We have an abundance of fruit and flowers, indeed, the air is redolent all the time with the sweet exhalations from the latter. A bunch of the most exquisite selections can be purchased for 12, 20 and 25 cents, which could not be obtained up North for many times those amounts.

The lower classes are the dirtiest, most degraded specimens of humanity that certainly can be found. Most of them, men and women, go about with portions of their bodies entirely exposed, reeking with dirt, which would require many applications of hot water and Castile soap to dispel. The men are simply beasts of burden, carrying loads like pianos, trunks, packing cases and so on, on their backs and heads with a submissive indifference. The women also can carry their share of burdens as well, although one does not see them doing it so much in the city as they do in the country. They carry their children tied about them in a light shawl, either on their breasts or backs. Pulque is the national drink. This is the juice extracted by suction from the Maguey plant, something similar to our century plant, which is put into vats for one or two days and allowed to ferment, when it is ready to use. It is barreled up and distributed about in pig skins (think of it) to the different pulque shops. The skin of the pig is taken off whole and sewed up, and it is an amusing sight to see a couple of these skins with the four legs sticking out, filled with pulque thrown across the back of a mule or burro. It is of a sour taste, not altogether pleasant at first, but rather satisfying when one is really thirsty. One can become intoxicated by drinking two or three bottles of it, but its influence is more soporific than stimulating. After imbibing to any extent the men are the most dutiful of husbands, meek and affectionate if at home, or if on the street they find a snug place in some alley or doorway and drop off to sleep to dream of Mexican sweethearts and pig skins. Indeed, these people can sleep any place. One frequently sees them with their backs close to some wall indulging in a nap with their heads on their breasts.

We have plenty of street cars, indeed Mexico is favored in this respect, and the lines are not confined to the city alone, but reach far out into the Valley many miles. The fares are very reasonable. The cars are drawn by mules, the drivers blowing a tin horn instead of a whistle to warn pedestrians. These horns emit perfectly hideous sounds. Smoking is allowed in all the cars, no matter whether ladies are occupants or not. In fact, smoking is indulged in every where here except in churches, the ladies apparently not minding the nuisance at all. If one goes out to a reception, ball or simply calling evenings, he need feel no compunction whatever in drawing his cigar or cigarette out and filling the room with smoke. There are also funeral cars, somewhat smaller than the passenger ones, with a canopy top and raised dais for the coffin to be placed upon. These go through the street along several routes to the several cemeteries, the coffin often embanked with flowers, and passenger cars following with friends of the deceased. The more one wishes to pay for display, the finer car and more horses he will have. Funerals are not conducted in any other way except by car, unless the poor peon packs the coffin, and his own child therein, on his back and carries it out to the cemetery, which one sometimes sees.

The better class of people are very nice, polite and genteel, and very affectionate in their greetings and partings. Hand-shaking is indulged in on the slightest pretext. A Mexican will shake hands when the cold blooded northerner would consider a nod of his head scarcely necessary. When the men meet in the street they generally hug and pat each other on the back; when the women meet they kiss each other on either side of the face. "*Adios,*" meaning goodby, is exchanged as one person passes an acquaintance without stopping. There are some beautiful daughters about the city, but they kalsomine their faces to an alarming degree, and would, therefore, run to ruin in a rain storm. Their eyes are wonderfully expressive and liquid like and, on the whole, a picture pleasant to look upon.

THE TELEPHONE EXCHANGE.

I am sorry I am not in a position to give you something of interest regarding telephonic enterprise here, but I have been postponing my intended visit to the general manager of the company, and I know but little of the inside workings of the company. The service is wretched, but, to a certain extent, the subscribers are to blame for this, as usual. Still the company might make many suggestions to its patrons that would materially improve communication. It is a dreadful bother to have proper connection completed. First, you ring for "Central," and hang up the receiver to wait for a reply ring from the operator, which is frequently very late in coming. When connection is completed, there is a ringing of magneto bells just bewildering. I imagine the operator rings to first caller to inform him her duty is performed, when he rings to his communicant to prepare for something, who in turn rings back to let it come. If "Central" is busy on first calling, and one persists in ringing for it, the probability is the operator will cut off the subscriber until she is ready, and he can turn the crank as much as he wishes without a sound from the bells. The company issues a plain book containing a list of subscribers, with their respective numbers, and is not so magnanimous as the New York and New Jersey and other United States companies, in giving instructions and making valuable and helpful little suggestions. The numbers in the list run as high as 1,050, which I take it for granted represents total exchange subscribers. There is no underground conduits or anything of that sort, though some of the Spanish papers are urging underground construction. But this is unnecessary, as the streets do not present a very bristling appearance with the poles, and it will be some time, if any, before underground work will have to be done. The electric light wires do not give much trouble, and induction from this source is about nothing.

Mexico, June 29, 1890. W. H.

Mr. Villard as an Electrical Prophet.

[From the N. Y. *Sun.*]

Mr. Villard, the other day, expressed very positively the opinion that great discoveries in electricity are at hand. In fact, he expressed this idea as absolutely as if the discoveries were already known to him. In five years, he said, there will not be a steam locomotive on any railway in the United States, and every kind of machinery will be driven by electricity.

BURNED OUT.

THE BIG WESTERN UNION BUILDING ON BROADWAY VISITED BY A DESTRUCTIVE FIRE.

The three upper floors of the Western Union Telegraph Company's building, at 195 Broadway, New York city, were completely destroyed by fire at seven o'clock in the morning of July 18th. The fire started in the distributing room on the sixth floor and rapidly spread to the fifth and seventh floors. About 50 operators were in the building at the time. All of these, except four men and three women, who were in the restaurant on the seventh floor, made their way safely out of the building before escape was cut off.

The seven mentioned took refuge on the balcony surrounding the tower which rises from the Broadway front of the building. Their situation was of great peril, as the flames were making quick approaches to the tower. A ladder was finally raised by the firemen, but fell 50 feet short of the balcony. A fireman climbed to the top of the ladder and tossed one of the girls a rope, which she made fast to the balcony. Two firemen then went up the rope, hand over hand, and let down the seven prisoners. Had the fire occurred a few minutes later, 700 operators would have had great trouble in getting out.

Every instrument and wire in the building was rendered useless, and it will be some days before business can be resumed, even in a temporary manner.

The "Yorktown's" Plates.

The United States man-of-war "Yorktown," "the prettiest cruiser afloat," is in the Brooklyn Navy Yard dry dock to have some of her steel plates repaired. Several of them are badly pitted. All iron and steel vessels are subject to pitting, but the troublesome part of it is that the cause is not certainly known. It is generally attributed either to corrosion or galvanic action. The majority of experts are now inclined to think the latter cause is the true one. The "Yorktown" has a large block of zinc on each of the propeller shafts. They were placed there with the idea of saving the iron hull from the action of the galvanic currents.

New Poles in Salem, Mass.

About seven store keepers might have been heard uttering about seven execrations apiece as they came to business this morning, says the Salem *News*, and discovered that during the night a 50-foot pole had grown up in the sidewalk in front of their respective places of business. They were put up last night by the street railway people, the electric lighting company furnishing the poles. A gang of men began work at 7 o'clock in the evening and at 6.30 the next morning, the job was done. The poles were erected without derricks of any kind, a dozen men hoisting the heavy poles into place by means of long pikes. The work will be continued at night until completion, and then Essex street will be the best pole-ornamented avenue in this county. But if the poles are large and close and unsightly, they are at least better than if each electric concern had little poles of its own. All the wires which run on the street will now be strung on these poles, which are amply strong for a heavy mesh of wires.

James W. Queen.

On July 12, Mr. James W. Queen, the well-known optician and instrument maker, of Philadelphia, died at Cresson Springs, Pa.

He was born in Philadelphia, in 1813, and after receiving his education, he entered the employ of the McAllisters, the opticians, with whom he remained for a number of years, being finally admitted to the firm.

Mr. Queen subsequently withdrew from the firm, and started the firm of James W. Queen & Company, which has obtained celebrity throughout the world, because of its electrical supplies and delicate apparatus. The deceased was married, in 1845, to Miss Abbie S. Dickey, who survives him. In 1868 he retired from active business, and since that time has been living quietly at No. 1204 Spruce street. He had been spending a week at Cresson in the hope of improving his rapidly failing health.

Interior Insulation.

There is just being issued by the Interior Conduit and Insulation Company, a new catalogue and price list, and from an advance copy we take the illustrations on this page. The first shows the method of destribution employed and the second the "crib" used in connection with the first. The Interior

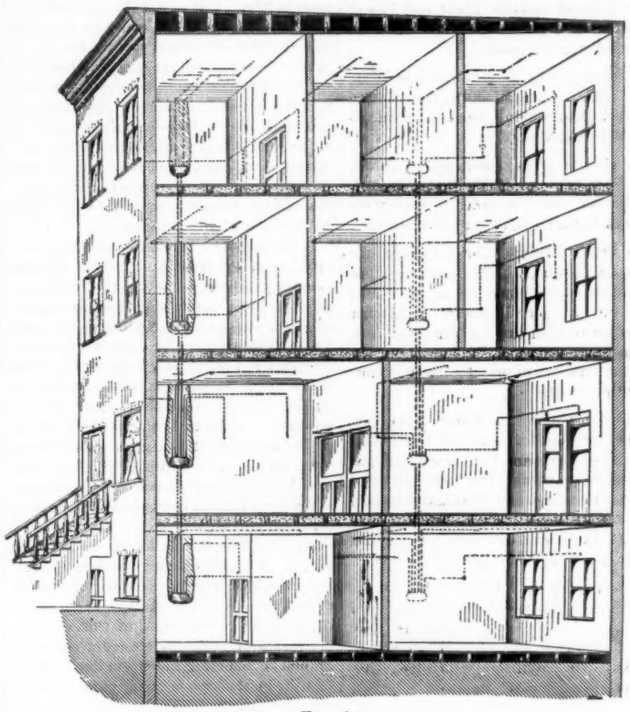


FIG. 1.

Conduit and Insulation Company state that they have demonstrated by experience that electric light wiring can only be done economically and effectively by the establishment of centers of distribution wherefrom to radiate all minor branch circuits, and this system has been modeled in its entirety upon this plan. For mains and feeders the company advise a separate tube for each conductor, in which a rigid wire with either underwriters' or weatherproof insulation may be employed, but for branches the special flexible twin conductor, with both conductors in one tube they claim should always be used. It is easily seen from the cut of the house that by employing as many risers as possible that long lateral runs, which are objectionable, are thereby avoided. We are pleased to notice the invention of many new and useful appliances which greatly facilitate and reduce the expense of the installation of this admirable system of electric wiring.

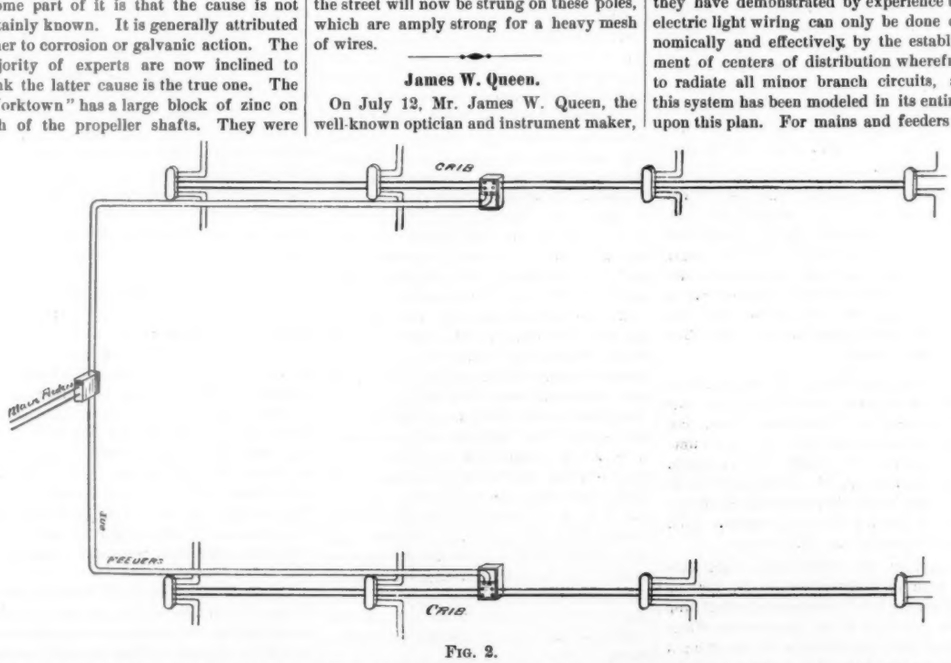


FIG. 2.

The Country Club, of Cincinnati, intends to buy special cars for the use of members traveling on the electric railway running from the city to the club house.

TELEGRAPHIC

.... The Western Union Telegraph Company will commence the work of running a telegraph line between Fort Madison and Des Moines, Ia., just as soon as the material can be had, the contract having been closed for the same.

.... The Thomson-Houston Company has shipped the machinery for the plant at the Castle Gate Mine, Utah, and will have it running next month. The station will be located near the mine, and is calculated to operate its entire equipment.

.... The Halifax and Bermuda newspapers exchanged messages the other evening congratulating each other on the completion of the cable connecting Bermuda with Canada and the world. The cable is working in a very satisfactory manner.

... The Pacific Postal Telegraph Company has commenced the construction of lines of telegraph from Port Townsend to Olympia, Wash. The line from Port Townsend to Olympia is to be tapped at Tenino, thus giving Tacoma additional wires to Olympia and direct wires to Port Townsend.

.... The operation of the Desant Electric Company's audible block signal system was exhibited in New York last week. The apparatus automatically rings a bell or blows a whistle in the cab of an engine entering a block that is occupied by another train. The noise continues until the train ahead leaves the block. The signal can be used in connection with a visual block signal, and provides an additional safeguard against rear collisions.

.... Every telegraph wire on the Union Pacific Railway was down last week near Sydney, Neb., and all communication by wire with the Pacific coast by this route was severed from daylight until late in the afternoon. A number of cowboys, who had been carousing around Sydney all Wednesday night, rode a few miles out of town in the morning, and set up a target against a telegraph pole. After shooting at it for awhile, they turned their attention to the insulators and wires, and desisted only when they had knocked off every insulator and cut every wire with their bullets. The Western Union Company sent repairers to the scene, but it took them all day to repair the damage.

.... A recent issue of the Scranton, Pa., *Truth* highly compliments the local management of the telegraph service. It says: "Superintendent Richard O'Brien, of the Western Union, and Manager Rigdon, of the Postal, may be complimented for their good work in this direction, and though many thousand words were sent over the wires, the complement could be easily doubled without disturbance of the general traffic. To know that about 400 columns of matter were sent over the wires in all directions during the sessions of the convention is a feat that our telegraphers may well plume themselves over, and Scranton may join in the felicitation. This is simply an illustration of the old saw, 'Where there is a will there is a way.' The managers of our telegraphic service managed well."

Steno-Telegraphic System.

A steno-telegraphic system was tried for the first time in the Chamber of Deputies, at Paris, France, recently. It is the invention of Cassagner, a civil engineer. The instrument makes possible the transmission of short or long hand reports of speeches any distance, as they come from the desk of the writer, at a much greater speed than has ever been reached. By this system, 25,000 words were transmitted to Brussels, 18,000 to Lyons and 15,000 to Marseilles. The rate was 180 to 200 words a minute, while only 100 to 120 words are ordinarily sent in the same time.

* * Westfield, Mass., citizens are expected this week to pledge $25,000 for an electric street railway.

* * The Sedalia, Miss.. Electric Railway Company started its cars regularly the latter part of last week.

* * The motors and equipments for 12 cars of the Naumkeag Street Railway Company have been received at Salem, Mass. The cars will be running August 1st.

* * The Newton Electric Street Railway Company, made its connection with its power plant in Waltham last week, and expects now to get its line into full operation this week.

* * The electric railroad between Victoria and Esquimault, B.C., is expected to be in operation by September 1. Trucks of 30 horse-power, of the Thomson-Houston system, are to be used, promising a rate of 20 miles an hour for the distance, five miles.

* * They have eight and a half miles of electric street railway in Paducah, and they say it gives the city a more metropolitan appearance than anything else ever could. When Cairo's electric railways are all in we will have about ten miles in all.—*Cairo, Ill., Bulletin.*

* * W. S. Warfield and the First National Bank of Quincy, Ill., have secured control and ownership of the Quincy Street Railway Company, together with the franchise recently granted to George F. Work, the Philadelphia bank manipulator, by the city. An electric system of street cars will at once be put in.

* * It is now proposed to build an electric railroad from Brockton to North Easton, Mass., and as there is no question but what such a road, if built, would receive liberal patronage, it is reflected that the project will materialize in a short time. An electric railroad could cover the distance in twenty minutes or less.

* * The recent remarks of Henry Villard, that within a few years all railroads in the United States would be operated by electricity, was probably based upon his knowledge of storage batteries. We understand that Mr. Villard has been experimenting with storage batteries for some years, and that he has one with which he has been perfectly well satisfied for more than a year.—*Boston News Letter.*

* * The West End Street Railway Company is building an enormous chimney at its central power station on Albany street, Boston; it will be built wholly of brick. The core will be plumb, and its inside diameter, or the width of the flue, will be 13 feet 8 inches. The outer section, or shell, is 26 feet 8 inches in diameter outside of the base, thence tapering to 17 feet 10 inches below the ornamental head, which, at the very top, will be 22 feet in diameter. It is calculated that the number of bricks in the shaft will be 1,123,099. The total weight of the structure, including the foundation, will be 5,774.14 tons.

* * The Brooklyn City and Newtown Railroad Company has filed a mortgage of all its franchises and property to the Mercantile Trust Company, of New York, as trustees. The amount of the mortgage is not to exceed $2,000,000, in 2,000 first mortgage bonds of $1,000 each. The bonds will draw five per cent. interest. The railroad company is to hold $960,000 worth of bonds to pay off outstanding mortgages. The other bonds are for the purpose of introducing steam or electricity in the place of horse power. The mortgage is signed by John W. Partridge, president, and Duncan B. Cameron, secretary, for the road, and Louis Fitzgerald, president, and Henry C. Deming, secretary, for the trust company.

GENERAL ELECTRICAL NOTES.

There are over 3,000 incandescent and 350 arc lights in Pueblo, Col.

Anaconda, over in Montana, is going to establish an electric lighting plant.

The Des Moines, Iowa, Suburban Railway Company is building a $20,000 electric power house.

The Newark Electric Light and Power Company, declared its quarterly dividend of 1½ per cent last week.

A company has been formed in Waukegan, Ill., to manufacture the Norton Electrical Bootblacking Machine, a nickel-in-the-slot contrivance.

The electric light company, of Ionia, Mich., has ordered a 1,300-light automatic incandescent motor, in order to supply the increased demand upon their power circuits.

The Brush Electric Company and the California Electric Light Company last week filed a bill of complaint in the United States Circuit Court against the Electric Improvement Company, of San Francisco, alleging an infringement of patents on electric light fixtures and praying for an injunction with damages.

Erie Telephone Company's net increase of earnings for April and May of this year, exceed the same two months of last year $13,000, and the first two months of this year (January and February) $3,000. The net increase of subscribers for June was 124, making a net gain for the first quarter of the new fiscal year of 417.

At a meeting in Baltimore, last week, of the Brush Electric Light Company, of that city, the following directors were elected: James S. Humbird, of Pittsburgh, president; Dr. William Whitridge, vice-president; Summerfield Baldwin, Edgar G. Miller, D. J. Foley, Francis E. Waters, G. W. Hebard, James E. Hooper and Lloyd L. Jackson.

Injunctions were ordered by Judge Coxe, of the United States Court, at Utica, N. Y., last week, in the cases of the American Bell Telephone Company against Austin Devoe, of Auburn, and W. H. Robinson, of Syracuse. The actions are brought for alleged infringement on the Bell patents. F. P. Fish, of Boston, made the motion for the plaintiff.

The work of putting the city wires underground has been temporarily suspended in Minneapolis. This is necessitated by the fact that the Brush Electric Light Company will soon begin the construction of about 17 manholes in the central part of the city, and if the city wires were put down now some of them would be disturbed by the Brush people.

The annual meeting of the stockholders of the Connecticut Electric Company was held last week, at Waterbury, Conn., and directors elected as follows: D. S. Plume, E. T. Turner, J. R. Smith, G. W. Beach, D. B. Hamilton, A. M. Young and C. M. Platt. This board afterward elected officers: President, David S. Plume; treasurer, E. T. Turner; secretary, A. M. Young.

A number of Philadelphia capitalists have been in Amsterdam, N. Y., for the past few days for the purpose of negotiating for the purchase of the Amsterdam Street Railroad, with the intention of converting it into an electric road. The contract has been drawn up and one of the committee has gone to Philadelphia to secure the signature of his company. The construction of the road will be begun very soon.

The local stockholders of the Badger Illuminating Company, Milwaukee, for the Villard syndicate, which recently obtained control of the Edison and Badger electric plants, elected the following directors: John A. Hiusey, Clarence S. Brown, E. C. Wall and R. L. Jennings, of Milwaukee, and D. S. Wegg, of Chicago, president of the Chicago & Northern Pacific Railroad, comprising the Wisconsin Central terminal lines at Chicago. Mr. Wegg will look particularly after the Villard interests.

A Piece of Advice to the New York Steam Heating Company.

BY DR. P. H. VAN DER WEYDE.

To the Editor of Electrical Review:

According to the statement of Manager Prentis, of the New York Steam Heating Company, as reported in the daily papers, the order of the Board of Health that their steam should be turned off was a great surprise to him. It is an equally great surprise to the public to be informed by him that this shutting off would involve the loss of motive power which the company furnishes to over 500 customers who run elevators, printing presses and many other kinds of machines used by large and small establishments, and that thousands of men would be turned out of employment from the inability of many large manufacturers to run without the motive power furnished by the New York Steam Heating Company.

It is, indeed, a revelation that the main business of the New York Steam Heating Company appears to be not the furnishing of steam heat but to supply motive power to steam engines, and, this being the case, I take the liberty to give them, respectfully, a reminder of what their experience of several years in the business must have demonstrated to them, that the transmission of power to a distance by means of live steam (notwithstanding it is a great improvement over belting and shafting, which is only practical for small distances) is an exceedingly uneconomical and impractical method, for the following reasons:

1st. The unavoidable losses of heat, even in spite of the best known and most carefully applied packing, necessitates a plant of most colossal steam-boilers, and a consequent great consumption of fuel, a large percentage of which is wasted to heat the ground surrounding the steam ducts. This fact, by itself alone, is sufficient to condemn the enterprise, while those who lately had charge of constructing the electric subways had a little experience of the enormity of the reckless waste of heat involved in such a system.

2d. The difficulty of making the connection at steam tubes perfectly tight, and keeping them so when subject to continual expansion and contraction by change of temperature, especially when placed comparatively out of reach underground, and only accessible by expensive labor and expense, is very great. It caused the utter failure of the company who had commenced to supply the eastern half of lower New York, and became bankrupt in the very beginning of its career, by repeated blow-ups. It abandoned the enterprise after having erected expensive buildings, etc.

3d. The present company who survived has now its turn in this respect for the simple reason that steam ducts as well as steam boilers are subject to deterioration, and need periodical inspections and reparations. Now this is so very difficult and expensive if it were applied to the underground steam ducts, as to be next to impossible. It would involve the periodical digging up of the streets, and of this the public has had enough thus far, and it is to be hoped the company has had enough also. They should consider that the combined heat and pressure in the pipes must exert a very deteriorating influence on the same, that the best pipes in 10 years must become old, whereby the soil saturated with gas leaks, etc., is another destructive factor.

For all these reasons the company should not wait until overtaken by the fate of its sister company, which cannot much longer be avoided, short of a complete reconstruction and renovation of the plant of all their tubes, which are at present pretty well worn out. The company should, therefore, abandon its defective system and substitute therefor the method of transmitting power by electric currents in place of steam, which during the last few years has been demonstrated to be perfectly practical, being not subject to any of the drawbacks enumerated above, and, therefore, is gaining ground everywhere.

The advantages of electric power transmission over that of steam are:

1st. There are no losses of current during transmission, as, fortunately, we have insulated coverings for the conducting wires, which make such losses next to nothing when compared with the enormous loss of heat during transmission in the steam ducts.

2d. All the loss is the resistance of the wire to the current, which in heavy wires is very small, and in any case far less than the resistance to the flow of steam by friction in the pipes, especially when elbows are encountered, which are no impediments whatever to the flow of electric currents.

3d. When we desire to overcome increased resistance in very long wires, we can generate currents of high voltage, that means pressure, such as used for arc lights; for such high pressure currents the resistance of the conducting wire is less, while for high pressure steam the resistance by friction is greater in proportion to the pressure.

4th. There is no difficulty in making tight connections in conducting wires, and no deterioration of the plant; as there is no destructible material buried, there are, therefore, never any leakages.

5th. The ducts for electric currents are far less bulky than those for steam, and require only a small trench next to the curbstone, while those for steam are very bulky, requiring much space, far more labor and hard labor at that.

6th. The difference between the two is especially striking when it is necessary to bring the steam or electric power to the upper floors of buildings. The ascending steam ducts are quite expensive, and require the extra labor of a covering to guard against loss of heat. The electric wire, to the contrary, is strung in out of the way corners and already covered when purchased; it may even be introduced through the window and over the roofs.

7th. As now arranged, the steam generated under the boilers in the plant is sent off and distributed through a neighboring section of the city by pipes under the streets, and at the places of destination is made to act upon small steam engines; if, in place of this arrangement, the steam is made to act directly on a steam engine placed near the boilers, and this engine used to revolve one or more large dynamos, and in this way the steam power is transformed into electric energy, then sent off and distributed through the neighboring section of the city by wires under or over ground, and made to act upon electric motors, a great economy would be the result, and all the objections removed which now are bringing the New York Steam Heating Company trouble.

If they consult the signs of the times, the advance made recently in electric transmission of power *versus* the now antiquated steam transmission, they will hasten to keep up with the progress of the age. They may probably even continue to furnish heat to those desiring it by means of electric radiators. The Electric Club in New York has introduced such in their headquarters. It is true that thus far they cannot compete with steam heaters in the amount of heat they radiate, but it is very probable that in a few years improvements in this direction will make their use more economical than it has been thus far.

I hope that the New York Steam Heating Company will take my suggestions in serious consideration; if no change is made they are bound to succumb, as their plant is continually deteriorating in quality, wherefore I counsel them to sell three-quarters of their steam generating plant, buy a few dynamos, and lay wires in place of the objectionable steam ducts, which will have to go anyhow.

If they are unwilling or unable to do this, let them sell out, while it is yet time, to people who are willing to introduce the reform, and let there be an end to the nuisance, which is endangering health, life and property.

* * The town of Terrebonne, Quebec, has granted a bonus of $10,000 to the Canadian Electric Manufacturing Company, as an inducement to them to establish a manufactory of electric appliances in that town.

Perret Low Speed Motors.

Mr. Frank A. Perret, electrician of the Elektron Manufacturing Company, Brooklyn, designed last year a line of low speed automatic electric motors which have met with considerable success. A detailed description has never before been published, as the company desired to give the machines actual tests before making any claims for them.

These motors differ from the well-known two pole Perret motors, in that they are of the multipolar type. This form has now been adopted for all sizes above two horse-power, and the company are carrying in stock machines of 4, 6, 8, 10, 15 and 20 horse-power, wound for 220 volts. They are also wound to order for any E. M. F. between 100 and 500 volts.

In these machines are well combined the three important features of high efficiency, low speed and close regulation, without excessive weight and bulk.

It is well known that most motors and dynamos are run at a high rate of speed, because the efficiency, regulation and output now demanded cannot be obtained at a low speed with the construction used. In the opinion of many of the best electrical and mechanical engineers of the country, this high speed is very objectionable on various grounds, and many of them have, during the past year, recorded their belief that the next great advance would be in the line of a large reduction in speed. This belief has long been held by Mr. Perret, who is one of the most level-headed men in the profession, and while others have been talking about this improvement, he, in his quiet way, has accomplished it. That the improvement made by him is a radical one, is apparent from the simple statement that the revolutions of armature per minute in the ordinary shunt-wound Perret motors of the new type is between 500 and 600 in the sizes ranging from 4 to 20 horse-power, and for special work they may be wound to run 350 revolutions or even less. It is not as fully understood by the general public, as by builders and electricians, that reducing the speed of a dynamo-electric machine reduces the power or output accordingly, and increasing the speed, increases it. For example, a certain Perret motor, running at 600 revolutions per minute, develops four horse-power. If it were wound suitably and run 1,200 revolutions per minute (which is lower than many others), it would be eight horse-power, and the price for an eight horse-power machine could be obtained.

The Elektron Manufacturing Company claim that in comparing prices, buyers should compare speeds also.

The practical advantages of low speed machines are many. For instance, in ordinary machine shops, wood working shops, printing offices, etc., the shafting is commonly run 200 to 300 revolutions per minute, and it is a simple matter to belt direct to it from a motor running 500 to 600 revolutions, thus saving the first cost of a counter-shaft and one belt, and saving considerable power which would be lost in transmitting through the counter-shaft and additional belt used necessarily with a motor running 1,000 to 1,500 revolutions. The same applies in the case of an elevator operated by belt, and in elevator work, indeed, it is possible to gear direct from the motor. The Perret machines have recently been applied by direct gearing to pumps and to coal cutting machines in mines, also to the operation of coal cutting machines by means of rope belt transmission from the motor to the cutter, and the company now have some very large orders for this class of work, which would have been very difficult with motors of high speed.

In addition to the advantages of low speed in the special cases mentioned, there is, of course, in all cases, a general advantage in the avoidance of the rapid wear and deterioration usually connected with high speed. The machines are built with a six pole field and with armatures of large diameter, thus securing a powerful torque and great momentum of armature, which is a decided advantage when a heavy load is thrown suddenly on, as is often the case in elevator work and all sorts of hoisting.

It is quite remarkable that Mr. Perret has been able to retain in these larger machines the distinctive feature of laminated field magnets for which his smaller machines are noted, and, indeed, the results secured would be well nigh impossible with any other construction.

In the illustrations, Fig. 1 is a side view of a 20 horse-power motor, complete with sliding base and starting box. Fig. 2 is an end view of the same, and Fig. 3 is a diagram showing a cross section of the magnetic circuit. It will be seen that the armature is a ring of comparatively large diameter with longitudinal channels on its periphery, in which the conductors are wound and thus embedded in the iron, which is in such close proximity to the iron pole pieces that there is practically no gap in the magnetic circuit. The field consists of three separate magnets arranged at equal distances around the armature, each magnet having two pole pieces. The winding is such as to produce alternate north and south poles. The magnets are built up of plates of soft charcoal iron, which are shaped as shown in the diagram, and the magnet thus produced is of such form that it may be readily wound in a lathe. A non-magnetic bolt passes through a hole in each pole piece, and the plates are clamped together between washers and nuts. These bolts also serve to attach the magnets to the two iron end frames, which are of ring shape and are bolted to the bed plates of the machine. The magnetic circuit is of unusually low resistance, by reason of its shape, its shortness, which is shown by the diagram, and the superior quality of iron used.

FIG. 3.—CROSS SECTION MAGNETIC CIRCUIT OF PERRET MOTOR.

There is no magnetism whatever in the frame-bed of shaft, as the magnets are supported at some distance from the frame by means of the non-magnetic bolts and the armature is mounted on the shaft by spiders of non-magnetic metal.

There is, therefore, no opportunity for magnetic leakage, and, furthermore, the whole is enclosed by a shield or case of sheet metal, as shown in Fig. 1.

The machines are calculated to be equally as efficient and desirable as dynamos, and their low speed makes them well suited for direct connection to steam or gas engines.

The Elektron Manufacturing Company have recently added largely to their cash capital, and have doubled their manufacturing facilities twice during the last six months. They now occupy nearly all of the large new factory building, 79-81 Washington street, Brooklyn, N. Y., one block from the Bridge entrance. Their works are notable for fine machinery, whereby all parts are made accurately and interchangeably to standard gauges, and for the methodical and careful arrangement of their business.

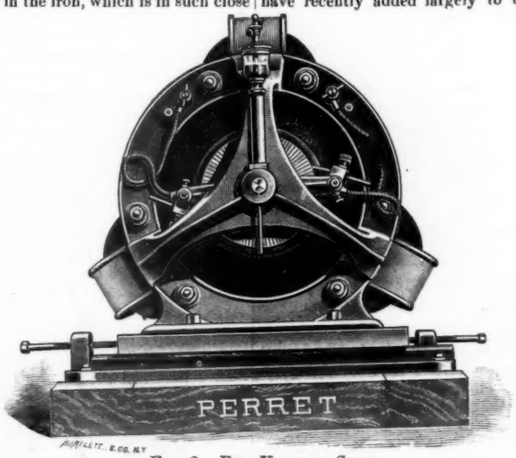


FIG. 2.—END VIEW OF SAME.

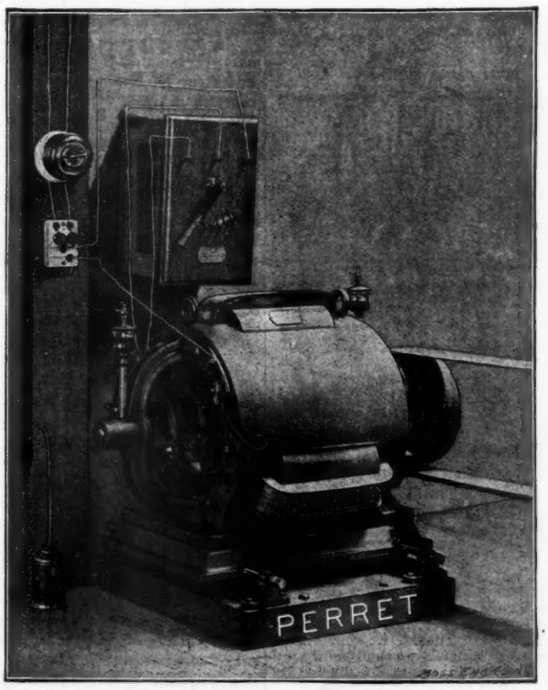


FIG. 1.—PERRET 20 H. P. MOTOR.

ELECTRIC LIGHT NEWS

—— The electric light system owned by the city of St. Joseph, Mo., is to be extended.

—— The Wooster, O., Electric Light Company is arranging to increase the size of its plant.

—— The Chaudiere Electric Light and Power Company, of Ottawa, Canada, proposes applying to increase its capital stock to half a million dollars.

—— The Ballston, N. Y., Electric Light and Power Company, on account of the increasing demand for the light, has decided to duplicate the plant already in use in September next.

—— The rivalry between the Denver Consolidated Electric Company and the Denver Electric Illuminating Company is becoming quite interesting. Both concerns are endeavoring to reach First avenue and Broadway with their wires first.

—— The Electric Light and Power Company, of Abington and Rockland, Mass., have applied to the selectmen of Abington and Rockland for locations for poles on the streets of the two towns. The company are negotiating for poles, and will begin work as soon as the selectmen take action.

—— The electric lights at Stoneham, Mass , have once more been turned on, after over a month of darkness, owing to a disagreement on the renewal of the contract between the selectmen and the Woburn Electric Light Company. All the lights were burning last week up to 12.30 A. M. A contract has been made for a year at $3,000, the matter being amicably settled by a compromise.

—— Work has been commenced on the new plant of the Butte, Mont., Electric Light Company. The buildings will be placed near the Butte Reduction Works, and will be built to meet the requirements of the business, regardless of expense. An entirely new plant has been ordered, and a portion of it is already on the way from the factory. It will be one of the most complete systems in the West when completed, and it is estimated will cost about $100,000.

—— The Thomson-Houston Company will erect a new building of brick, 60 by 80 feet, two stories in height, in the rear of factories A and B, at Lynn. The building is to be used for an oil house and japanning room. The oil room will hold 80 barrels, and will be entirely fireproof. In the next room is a 20,000-gallon cistern, with fire pump and hose. Factory K is being rapidly rushed. Factory J, on Centre street, for the manufacture of mining machinery, is completed and ready for occupancy.

—— The Pittsfield, Mass., Illuminating Company, the Pittsfield Electric Light Company, and the Pittsfield Coal Gas Company have united as the Pittsfield Electric Company, with a capital of $100,000. The officers are as follows: President, Alexander Kennedy; treasurer, William A. Whittlesey; clerk, W. L. Adam. The directors are, William Stanley, Jr., William R. Plunkett, C. E. Merrill, and Messrs. Kennedy and Whittlesey, the president and treasurer. A new station is to be built at once.

—— At Mr. Rockefeller's splendid estate, on the Hudson river, a system of electric lighting, costing over $150,000, has been installed. He can now, by moving a small button in his library, illuminate acres of his beautiful grounds at midnight, if he pleases. The wires are all carried under the sod and out of sight, and the lights are arranged in a wonderful artistic fashion in the trees and foliage. Such a fortune as that expended in electricity, and in lighting a country place, is unprecedented in history. Even the new roof in Blenheim Palace, about which everybody in England has been talking, cost less than $100,000.

New York Electric Club.

Mr. W. H. Fleming, a well-known member of the Club, connected in a responsible way with the Edison interests, is a brother of Dr. J. A. Fleming, the able English writer, author of "Short Lectures to Electrical Artisans." This book is one of the most popular electrical works published.

The Tales of Fishermen are again to the fore at the Electric Club. Mr. James Kempster is enjoying the hauling in of about an even 100 of blue fish every other day, down at the Olympic Club, on Long Island, and is so well aware of the skepticism with which fish stories are received that he always furnishes affidavits of spectators to prove his statements when necessary. Geo. T. Manson, with an Okonite line, went fishing with a party recently, and played a mean joke on his daughter, Miss Edith Manson. The fish wouldn't bite, and Miss Edith was greatly disappointed, so much that her indulgent father, with the aid of the skipper, supplied a "bite" in the shape of a dead herring, which was placed on the hook while the ladies were below at lunch. The proud way in which the fish was pulled in a few moments afterwards, with "I knew I would catch one," mightily pleased the wicked conspirators, whose joy was complete when, with an energetic jerk, a red herring, that had breathed its last many moons before, was landed on the deck to the horror of the fair holder of the line. It is a mean father when his daughter asks a fish who will give her a stone-dead herring!

Chairman Chamberlain, of the House Committee, is one of the most faithful and broad gauged workers that ever held office in the Club. Under his management, the Club has become second to none in the city in point of cleanliness, comfort and *cuisine*. The best steaks in this great city can be secured at this Club. This is the universal opinion of all Club men familiar with New York's cooking who have tried the Electric.

Philadelphia's Electrical Service.

Chief Walker, of the Philadelphia Electrical Bureau, has just issued his annual report, from which we take the appended information:

"During the year," says Chief Walker, "I have approved the extinguishing of 496 gas lamps, 42 gasoline lamps, relight one gas lamp; total extinguished for 1889, 537; and a grand total where the electric lights have been introduced of 3,717 lamps extinguished.

"The receipts during the year were $18,655. There were on the 31st day of December, 1889, on the highways of the city (exclusive of those along railway tracks), 5,495 poles, a decrease of 180; 5,117 city poles, an increase of 468; and a total of city and all other poles of 10,612, an increase of 288; 4,306 miles of telegraph and telephone wire, being a decrease of 17 miles; 381 miles of electric light wire, an increase of 103, and 903¾ miles of city wires, an increase of 108¼ miles; making a total of city and all other wires on poles, fixtures and buildings, of 5,590 miles, an increase of 193¼ miles.

"There are 12,200 attachments to city poles, being an increase of 795, to support 362¼ miles of wire. The increase of poles was mainly due to the extension of the electric light service for lighting the highways, to the system of central distribution adopted by the Bell Telephone Company for their underground service, and the extension of the city's electrical service.

"At the close of the year there had been placed underground in the city 892.44 miles of telegraph, telephone and electric light wires. There has been placed underground a total of 395,125 feet of wood conduit, of which the city owns 39,232 feet; 104,097 feet of iron and 1,581 feet of fibre; 16,870 feet of iron pipe and 10,634 feet of wood tubing has been laid by the Penn and Edison Electric Light Companies for the use of the city.

"The bureau has 903¾ miles of wire overhead and 63.24 miles underground, 240 sentry booths, 257 signal boxes and 5,117 poles; and as the total number of poles is 10,612, the city appears as the owner of nearly one-half of those still in use. There are 4,306 miles of telegraph and telephone wire, and 381 miles of electric light wire."

New Alternating Current Motor.

The Westinghouse Electric and Manufacturing Company is now making a new alternating current motor, which is said to have many advantages over any similar motor. As it does not require any higher tension than the ordinary 50-volt alternating current, its usefulness makes it especially commendable for the operation of sewing machines and other minor requirements of power. The company has already received orders for 500 motors.

Kemmler's Doom.

The prospects at present are that the sentence of electrocution will be carried out upon the murderer Kemmler, during the week beginning August 4th, at Auburn prison, by Warden Durston. All the various restraining processes of the law seem to have been utilized, and unless the murderer is pardoned, which is not at all probable, the death sentence as originally imposed will be fulfilled.

Electric Light at the Paris Observatory.

Small incandescent lamps are being used at the Paris observatory for lighting the graduated circles of the different astronomical instruments. The lamps can be turned on at the will of the observer only, and are not kept constantly glowing, as the light from them, though feeble, would nevertheless be sufficient to effect the sensitiveness of the eye of the astronomer when engaged on some of the more delicate observations. To still further protect the eye, the lamp is shielded, so that even in making a reading, the eye is not struck by direct rays from the lamp, but only by those reflected from the graduated surface.

Choosing a Rubber Belt.

There having been expressed a desire for a table which would show about how much rubber belt cross section there was needed to carry various horse powers at various speeds, the following table is offered as being convenient and practical for horse powers from 10 to 100, inclusive, and for belt speeds from 2,000 to 2,750, inclusive. The belt is supposed to be fastened with single leather lacing. Doubling the lacing adds about one-eighth to the driving power, other things being equal, and, of course, calls for only about eight-ninths as much cross section for a given horse power. If the joints were riveted there would be required only five-ninths as much belt for a given power.

BELT CROSS SECTIONS.

	Belt Speeds. Feet per minute.			
Horse-Power.	2,000	2,250	2,500	2,750
10	.7	.62	.56	.51
15	1.	.7	.8	.8
20	1.4	1.2	1.1	1.
25	1.7	1.6	1.4	1.3
30	2.1	1.9	1.7	1.5
35	2.4	2.2	2.	1.8
40	2.8	2.5	2.2	2.
45	3.1	2.8	2.5	2.3
50	3.5	3.1	2.8	2.5
55	3.8	3.4	3.1	2.8
60	4.2	3.7	3.4	3.1
65	4.5	4.	3.6	3.3
70	4.9	4.4	3.9	3.6
75	5.2	4.7	4.2	3.8
80	5.6	5.	4.5	4.1
85	6.	5.3	4.8	4.3
90	6.3	5.6	5.	4.6
95	6.6	5.9	5.3	4.8
100	7.	6.2	5.6	5.1

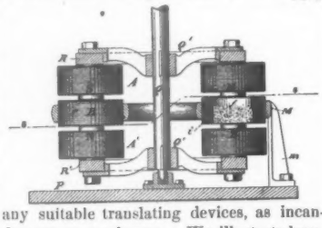
Thus, if we have to carry 50 horse-power and know that we are going to have belts running 2,250 feet per minute, we can see at once that it will take 3.1 square inches of cross section of rubber belt laced with single leather lacing, and having 180 arc of contact upon a cast-iron pulley in good condition. We can make about this by having 12 inches of belt one-quarter inch thick or 15 inches of belt one-fifth inch thick; or if we know how wide we shall have to have our belt we can figure up very readily what thickness to get. Thus, if we cannot have more than a 10-inch belt we shall know very quickly that it will require 3.1 divided by 10, equal to 0.31 inch of belt thickness.

For other belt speeds than those given it will take in inverse proportion; thus, for 1,125 feet of belt speed per minute it will require double the quantity; that is, 30 inches of one-fifth inch belt, or 24 inches of one-quarter inch, and so on.—*Robert Grimshaw in India Rubber World.*

RECENT ELECTRICAL PATENTS.

A DEPARTURE IN CONVERTERS.

Mr. A. De Castro patented a strikingly novel system of generating and converting electric energy, on July 15. It is proposed to substitute for the solid or laminated core ordinarily used in induction apparatus, a mass of iron or magnetic filings, or even chips or small shot of magnetic material. Where the idea is applied to a converter, the secondary coil is fitted with rubber or mica heads, the central chamber thus formed being filled about two-thirds with iron filings. The coil thus provided with a finely divided core is placed axially in a field of force established by an alternating or pulsating current. Free movement of the parts of the core is thus secured; and perhaps also the magnetic inertia of the iron will figure as a less important element than in solid cores. It is stated that with each reversal of direction of lines in the field of force, —that is, with each change of polarity of the current—the filings change place in the containing chamber, and are thrown into a rapid reciprocatory movement, first toward one field pole and then toward the other, their movements exerting an inductive effect upon the enclosing secondary coils which is superadded to the induction due to the flow of lines of force across the plane of the same coils. The inventor has projected a variety of forms of apparatus all involving the use of this finely divided core. In utilizing it in dynamo-electric generation, a series of coils containing the finely divided material as a core are placed horizontally in a fixed ring, and a series of electro-magnets are arranged so as to present north and south poles to each fixed coil in succession, the induced currents developed by the sweep of the polar field through the fixed coils and finely divided cores being carried off to supply



any suitable translating devices, as incandescent or arc lamps. We illustrate herewith the generator, from which, with the foregoing statement, our readers will have no difficulty in understandingthe clever idea.

AN IMPROVED COMMUTATOR

has been patented by Frank A. Perret, of Brooklyn, N. Y., designed for use in a generator provided with multiple pole pieces. The point to the invention, say, in a six-pole machine, lies in providing a series of tridented spiders of sheet metal which may be laid in parallel planes on the end of the commutator, and have their three dents inserted in the bifurcated ends of three corresponding commutator bars, the coil, connecting wires and the dents being all fastened by solder at the same time. The commutator segments are thus grouped, three and three, in a manner which assures good balance, and renders the commutator easy of adjustment and repair.

AN ELECTRIC LOCOMOTIVE

has been patented by W. H. Knight, of New York, in which the motor is provided with both rotating field magnet and armature. The two are independently geared to the car axle so as to tend to move it in one direction. By permitting both field magnets and armature to rotate, a high counter E. M. F. is developed with a low absolute armature speed, thus putting the motor in good working condition under load before it reaches a very high speed.

OTHER IMPROVEMENTS

in electric locomotives have been patented by J. F. McLaughlin, of Philadelphia. It is proposed to permit the motor to run continuously, and by means of a single lever to actuate a clutch to connect or disconnect the car axle with the driving motor, and simultaneously put on or take off the brake. The same inventor patents an electro-magnetic clutch in which a series of iron shoes are radially placed with reference to a friction drum also of iron. The shoes are polarized by electro-magnets and forced radially outward into frictional and magnetic engagement with the inner face of the drum, thus clutching the motor and its work, connected respectively, to the two members of the clutch. The same inventor, in another patent, proposes to drive a surface car by means of a motor enclosed by and moving within a subway or conduit. Within the conduit are two pairs of line conductors, each of which constitutes tracks on which travel the wheels of a truck containing one or more electric motors, the wheels being forced into frictional engagement with the track conductors, insuring good contact frictionally and electrically. The motor is connected with the surface car by an arm extending through a slot in the conduit. The surface car is provided with means for varying the tractive friction of the conduit motor so as to stop, start or change its speed.

AMONG OUR PROVINCIAL WRITERS.

Happy Yet, You Bet!

Make your bets that the electric street cars will be running in our city by November 1st.—*Burlington Hawkeye.*

An Inspiring Topic.

Colton, the third town in the county, should at least have a few electric lights. A progressive people are not content with the Arcadian simplicity of primeval periods, nor with the backwoods methods of old fogies.—*Colton, Cal., Chronicle.*

A Company to be Envied.

The electric light company has lots of money, and the plant grows in proportion. McCown Hunt is no slouch.—*Leavenworth, Kan., Sun.*

It Brings Out the Editor's French.

Our electric railway is *fait accompli;* the first train having been run over the road on Friday afternoon last, and regular hourly trips having been maintained this week. Everybody seems to rejoice at this fortunate consummation.—*Seneca Falls Journal.*

The Electric Light Company at Rutland, Vt.

The annual meeting of the Rutland Electric Light Company was held last week and the following named directors elected: E. P. Gilson, Justin Batcheller, M. J. Francisco, A. H. Abraham, H. W. Cheney, I. H. Francisco, B. F. Pollard, C. E. Ross, F. H. Richardson, W. H. Valiquette and G. H. Reynolds. There were a few scattering votes cast for A. C. Bates, J. B. Lewis, H. M. Bates and Fred. A. Field.

The following resolution was unanimously carried, with instructions that the secretary enter same on the record book of the company:

Resolved, That M. J. Francisco, president, is hereby tendered thanks from the stockholders for the faithful performance of the duties of his office and for his personal endeavor to further the company's interests.

The following ticket was thereupon elected by acclamation: President and general manager, M. J. Francisco; vice-president, Justin Batcheller; secretary, I. H. Francisco; treasurer, Chas. E. Ross.

Annual Meeting of Massachusetts Electric Lighting Association.

The first annual meeting of the Massachusetts Electric Lighting Association was held on the afternoon of July 16, at Hotel Pines, Point of Pines. This association includes 30 of the leading local electric lighting companies in the State, representing a capital of $5,000,000, and 50 representatives of these various companies were present. The treasurer's and attorneys' reports were read, and the following officers elected for the ensuing year: President, Frederick A. Gilbert, of the Boston Electric Light Company; first vice-president, Hon. Theodore C. Bates, of the Worcester Electric Light Company; second vice-president, George W. Fifield, of the Lowell Electric Light Corporation; executive committee, Frederick A. Gilbert, Hon. Theodore C. Bates, George W. Fifield, C. L. Edgar, of the Edison Illuminating Company, of Boston, and C. A. Nichols, of the United Electric Light Company, Springfield.

After passing a vote of thanks to President F. A. Gilbert for his able and efficient administration of the affairs of the association, the meeting adjourned to the dining hall, where a substantial repast was enjoyed.

KINDRED INTERESTS

Brownlee & Company, Detroit, have a continually increasing demand for their cedar and pine telegraph and telephone poles and railway and telegraph supplies. They have exceptional facilities for filling orders for such goods.

Frederick Pearce will succeed to the business formerly carried on by Pearce & Jones, manufacturing electricians, at 77-79 John street, this city. The partnership formerly existing between Frederick Pearce and James Jones was recently dissolved.

The Wyckoff Pipe Company, of Williamsport, Pa., are shipping large quantities of their wooden tubing to the various electrical companies in this country and Canada, for use in underground work. Toronto, Can., has recently taken several carloads; Buffalo, N. Y., five carloads; and Philadelphia, over 125,000 feet.

The Wenstrom System is fully described in catalogue "A," issued by the American selling agents, Chadbourne, Hazelton & Company, of Philadelphia. The fundamental principles of the Wenstrom dynamo are set forth and its points of difference from other machines are taken up. The catalogue is an artistic piece of work, and the information contained within its handsome cover is concise and valuable.

The Simplex Electrical Company, Boston, continue to receive compliments upon their anti-induction telephone wire. Mr. R. T. Ramsey, treasurer of the Federal Street and Pleasant Valley Passenger Railway Company, of Pittsburgh, writes as follows: "It affords us pleasure to say that we have found the anti-induction telephone wire, furnished us by your company for our private telephone lines, all and more than was claimed for it. Our system consists of a central station, comprising 14 telephones and 10½ miles of wire. The wire is placed upon the same iron cross-arms and iron poles upon which are placed the feed wires from our power station, through which we operate 20 miles of road and 50 motor cars. We find the service perfect, and disturbance from induction or other cause entirely absent." Mr. J. I. Ayer, general manager of the St. Louis Municipal Electric Light and Power Company, also praises the wire in high terms.

The Equitable Electric Railway Construction Company, of Philadelphia, are installing the entire plant for the Richmond and Southside Electric Railway, at Richmond, Va. The road is double track, about five miles long, running from the locomotive works in Richmond over Seventh street and across the new bridge into Manchester and Woodland Heights. The overhead work is of the most substantial character. Octagonal yellow pine poles 18" diameter are used, and each pole has iron steps on its side for convenience in climbing. The regular Sprague overhead system is being used. There will be five vestibuled Brill cars, each having two 15 horse-power Sprague motors of the regular type. Patent noiseless wooden tooth gearing, built by the Equitable Electric Railway Construction Company, will be used on these cars. The power house is being equipped with one 80,000 watt Edison compound generator driven by a Ball high speed engine of 100 horse-power. The entire equipment of this road, exclusive of the track, including power station, cars, engines, boilers, etc., was given the Equitable Railway Construction Company, and they are pushing the same forward in the most substantial manner.

The Scenic Beauty of the Pennsylvania Railroad.

At no season of the year is the scenery of the Juniata Valley, the Alleghenies and the Conemaugh, more attractive than now, and there is no better medium of thoroughly enjoying it than that afforded by the observation car of the Pennsylvania Limited. This greatest of all trains, with its superb equipment, passes through Pennsylvania by daylight, and its observation car is always filled with delighted tourists. The Limited leaves New York from stations, foot of Cortlandt and Desbrosses streets, every day at 10 A. M., for Cincinnati and Chicago.

Another For Bell.

The suit of the American Bell Telephone Company ended on July 18, in the United States Court in Parkersburg, W. Va., and a permanent injunction was granted by Judge Jackson, against the Long Telephone Company. The Long Telephone Company began the business of manufacturing and operating their instruments in Parkersburg, under patents granted the Long Telephone Company, which was incorporated under the laws of West Virginia, previous to 1886. In that year year the Bell Telephone Company obtained through their counsel, the Hon. V. B. Archer, a temporary injunction. During the past four years the depositions and written testimony taken amounted to many thousand pages of manuscript. The court has now made the temporary injunction permanent, and prohibited the Long Telephone Company from manufacturing, operating or renting, any of their machines.

Cipher Blunder.

In December last, Philip Wolf & Company sent a cipher dispatch to Theo Bernheim, at Medford, Ore., instructing him to buy $3,325 worth of hops at 8½ cents per pound. The Western Union Company made a mistake in the transmission of a return message from Bernheim, and in consequence, the dispatch could not be deciphered. Bernheim then had recourse to the wires of the Postal Telegraph Company, and after arriving at a mutual understanding, Bernheim was instructed to make the purchase. Before he received the dispatch, the hops were sold. Wolf & Company lost $684 by the error. They assigned their claim against the Western Union Company to Robert Acheson, of San Francisco, and he has brought suit to recover the amount.

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON JULY 15, 1890.

432,022 Means for generation and conversion of electric energy; Angel De Castro, New York, N. Y., assignor to the De Castro Electric Generator Co., same place.

432,040 Electric stop motion for warping machines; John P. Haslam, Wilmington, Del., assignor of seven-tenths to Francis E. Gallagher, Samuel L. Foster and John T. Ahrens, all of same place.

432,049 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Co., of Connecticut.

432,050 Induction coil or transformer; Carl E. Kammeyer, Eau Claire, Wis.

432,058 Electric meter; Phillip H. Korst, Racine, Wis.

432,063 Trolley; William C. Miller, Albany, N. Y.

432,080 Hydro-carbon burner; Sumner C. Reilly, Terre Haute, Ind.

432,095 Electric railway switch; Wm. D. Swart, Boston, Mass.

432,098 Telegraphic relay; John M. Treber, Louisville, Ky.

432,131 Current regulator or rheostat; Otto Fleming, Philadelphia, Pa.

432,136 Electrically propelled vehicle; Rudolph M. Hunter, Philadelphia, Pa.

432,142 Electric locomotive; Walter H. Knight, New York, N. Y.

432,169 Dynamo electric machine; Frank A. Perret, Brooklyn, N. Y.

432,197 Electric cigar lighter; Robert Graham, Reading, Mass.

432,202 Electrode for secondary batteries. 432,203 Car brake. 432,204 Means for electric locomotion. 432,205 Electric heater. 432,206 Commutator brush. 432,207 Electric switch. 432,208 Electric motor car. 432,209 Electric clutch; James F. McLaughlin, Philadelphia, Pa.

432,215. Apparatus for detecting short circuit; Harvey Redding, Everett, Mass.

432,234 Electric switch; Arnold C. Frey, Wilkinsburg, Pa.

432,237 Electrically propelled vehicle; John W. Henderson, Philadelphia, Pa., assignor to the Electric Car Company of America, of Pennsylvania.

432,260 Hydro-carbon engine; Geo. B. Brayton, Boston, Mass.

432,279 Current regulator or rheostat; Geo. B. Massey, Philadelphia, Pa., assignor to Otto Fleming, same place.

432,284 Electric arc lamp; Edwin C. Russell, Boston, Mass.

432,310 Regulation of arc light circuits; Daniel Higham, Boston, Mass., assignor to the Higham Patent Right Company, of Rockland, Me.

432,345 Multiplex electric locomotive; Chas. J. Van Depoele, Lynn, Mass.

432,387 Armature of dynamo-electric machines; Oscar A. Euholm, New York, N. Y., assignor by direct and mesne assignments of one-half to Julius M. Heyman, same place, and Emmanuel Duret de Brie, Cognac, France.

436,416 Conduit for electric or cable railroads; John Lynch, Washington, D. C.

432,453 Printing telegraph; William W. Taylor, Mansfield, Mass., assignor of one-half to Ellen Maria Leavens, Providence, R. I.

432,462 Graphophone; John H. White, Washington, D. C.

432,490 Manufacture of carbon conductors; Achilles De Khotinsky, Giluhausen, Prussia, Germany.

432,500 Armature. 432,501 Electric car; Edward Wagemann, Little Rock, Ark., assignor of six-sevenths to John D. Adams, Dean Adams, Oscar Davis, John W. Davis, Horace G. Allis and John B. Jones, all of same place.

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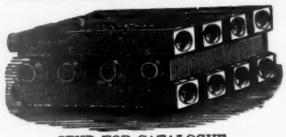

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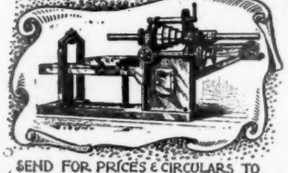

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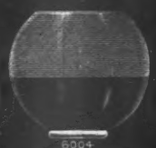

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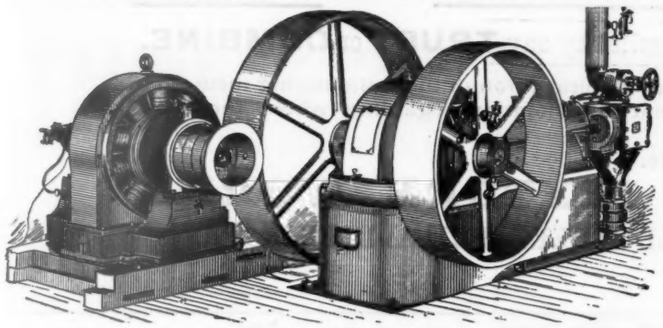

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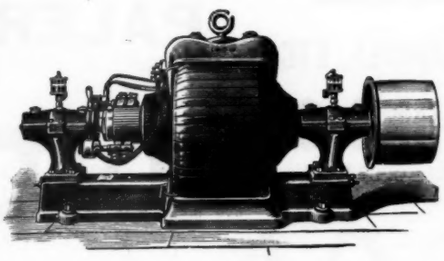

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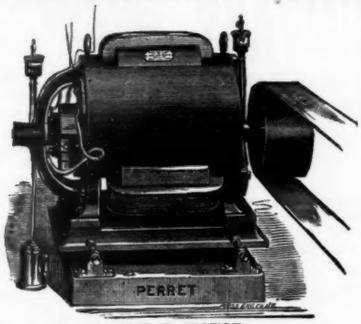

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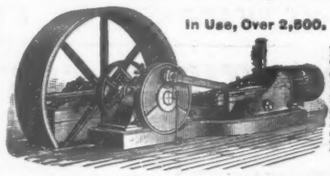

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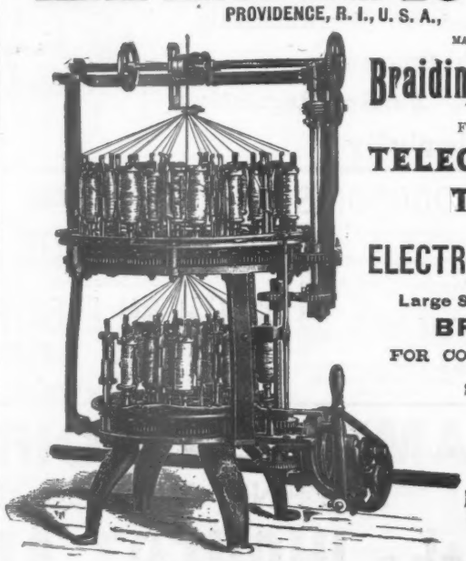

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No central station can be operated to advantage without the Shallenberger Meter. No gas company, however small, would think of operating a station without meters, and the same reasoning is applicable to all electric light plants. Send for special circular on the Shallenberger Meter.

The Westinghouse Electric Company was the pioneer in the manufacture of Alternate Current Dynamos in America, and all of its apparatus is celebrated in this Country and abroad for its durability, efficiency and the satisfaction it has given to purchasers.

The Westinghouse Electric Company has recently utilized the Alternating Current for Arc Lighting. Send for special circular just issued. A simple single carbon lamp runs four nights without renewal of carbons. Dynamos of the following capacities constantly kept in stock, together with a full outfit of detail apparatus and lamps:

25, 40, 60, 125, 250.

No wall fixtures are required in the Alternating Arc System.

The machine is inherently self-regulating, from full load to short circuit.

THE WESTINGHOUSE ELECTRIC COMPANY,

PITTSBURGH, PA., U. S. A.,

Boston, New York, Cincinnati, Chicago, St. Louis, San Francisco, Portland, Ore., Dallas, Tex., Charlotte, N. C.

THE BEST

SOLID RUBBER CORE WIRE

ON THE MARKET.

IN ORDER to meet the demand for an ABSOLUTELY RELIABLE, YET LOW-PRICED, Solid Rubber Core Wire, the Edison Machine Works have produced a new line of this class of goods, made up in all sizes, from No. 0000 to No. 20. It is the equal in quality, finish and durability of their other well-known wires. ONCE TRIED, it will always be used in preference to any other. . . . . .

It is the NE PLUS ULTRA.

For Prices, Samples and other Information, address,

The Edison Machine Works,

JAMES F. KELLY, General Sales Agent,

19 DEY STREET, NEW YORK.

BOTTOM-LESS

TO THE PUBLIC: We have recently received among other large orders one for 1,000,000 feet of No. 14 A. W. G. B'd Okonite Wire. This particular order was placed with us solely on the merits of Okonite insulation, and after the company ordering had tried all the low-priced imitations. An advertisement appeared in the last week's issue of several electrical papers in the form of a letter which undertakes to give the result of an alleged test. In connection with the letter referred to, we beg to call attention to the following, which explains itself:

"COPY."

THE DENVER CONSOLIDATED ELECTRIC COMPANY,

SYSTEMS:
Brush Arc, Westinghouse Alternating,
Edison Municipal.
Please address all communications to 1534 Lawrence St.

GENERAL OFFICE,
1534 LAWRENCE STREET,

C. H. SMITH, President.
E. W. ROLLINS, Vice-President.
W. W. BORST, Manager.
M. D. LAW, Supt. and Electrician.

(DICTATED.)

DENVER, COLO., JULY 12, 1890.

CENTRAL ELECTRIC CO., 116-118 Franklin Street, Chicago, Ill.

GENTLEMEN: We beg to acknowledge the receipt of your communication of the 10th inst. in regard to an advertisement, the same purporting to be a copy of a letter written on our letter head and signed by H. Bottomley.

We beg to state this has been done **without the authority or knowledge of this Company, and should not have any weight or be considered at all.** We knew nothing of such a letter having been issued, **and Mr. Bottomley has surely no authority** to give such letters, and it will not occur again. Very respectfully,

THE DENVER CONSOLIDATED ELECTRIC COMPANY,
By C. H. SMITH, President.

WE WILL NOT MISREPRESENT OR TRY TO CONCEAL FACTS.

CENTRAL ELECTRIC COMPANY,

116 & 118 Franklin Street, Chicago.

Connected by Private Wire with Postal Telegraph Cable System.

UNITED ELECTRIC TRACTION COMPANY,

EXECUTIVE OFFICES, 115 BROADWAY, NEW YORK.

AGENCIES:

13 South 4th Street, Philadelphia. 111 Water Street, Pittsburgh, Pa. 456 Rookery Building, Chicago.

Electric Railways and Power Stations,

STATIONARY MOTORS, STORAGE BATTERIES.

DYNAMOS, 1 to 250 H. P. MOTORS, ½ to 100 H. P.

WORKS, JERSEY CITY, N. J.

BROWNLEE & CO.,

DETROIT, MICH.

CEDAR POLES

For Electric Purposes.

THE LARGEST STOCK AND QUICKEST SHIPMENTS.

☞ Manufacturers of the Celebrated Octagonal Red Pine Poles for Electric Railways and Electric Lighting; also Manufacturers of Cross-Arms and Pins.

THE WALKER ELECTRIC CO.,

MANUFACTURERS OF THE

WALKER ELECTRIC METER,

THE ONLY RELIABLE METER IN THE MARKET,

50 BROADWAY,

EDWIN SCOTT, President,
GEO. W. WALKER, Vice-Prest. & Gen'l Manager,
LEWIS G. TEWKSBURY, Sec'y and Treas.

NEW YORK, U. S. A.

SPRAGUE ELECTRIC RAILWAY SYSTEM.

MORE THAN ONE HUNDRED DIFFERENT STREET RAILWAYS IN OPERATION OR IN COURSE OF CONSTRUCTION.
MORE THAN ONE HUNDRED AND SEVENTY-FIVE SEPARATE ORDERS FROM STREET RAILWAYS FOR ELECTRICAL EQUIPMENTS.

The Sprague Electric Railway System has been proved to be the most DURABLE, RELIABLE, ECONOMICAL AND CONVENIENT.

SPRAGUE ELECTRIC RAILWAY AND MOTOR COMPANY, 16 and 18 BROAD STREET, NEW YORK.

CONRAD N. JORDAN, President. E. GOCORZA, Vice-Prest. & Treas. JAMES DUNNE, Secretary. J. R. BURDICK, Manager.

THE TRINIDAD-HEIMANN INSULATED WIRE CO.,

OFFICE, 49 LIBERTY STREET, NEW YORK. WORKS, HARRISON, N. J.

THE CELEBRATED TRINIDAD LINE WIRE. THE HEIMANN FIREPROOF INSULATED WIRE.

House Wire, Underground and Submarine Cables, and Solid System of Underground Wire, Manufactured by this Company.

LIST OF DYNAMOS IN STOCK.

Designation of Machine.	No. Lights 2,000 c. p. 10 amp. X	No. Lights 1,600 c. p. 8 amp. Y	No. Lights 1,300 c. p. 6 amp. Z	No. Lights 800 c. p. 4 amp.	Horse-Power at Pulley of Dynamo.	Width of Single Belt in Inches.	Belt Speed Required.	Weight of Dynamo.
C	8	.....	.....	.....	6.5	1½	5,000 FEET PER MINUTE.	530
C	.....	10	.....	.....	6.3	1½		530
C	.....	.....	.....	25	8.0	2		530
E	16	.....	.....	.....	12.0	2½		780
E	.....	20	.....	.....	12.5	2½		780
E	.....	.....	26	.....	13.0	2½		780
E	20	.....	.....	.....	15.0	3		990
E	.....	25	.....	.....	15.6	3		990
E	.....	.....	32	.....	15.0	3		990
E	.....	.....	.....	50	16.0	3		990
E	28	.....	.....	.....	21.0	4½		1,360

Ball Electric Light Co.,
404
WEST 27th STREET.
NEW YORK.

LIST OF DYNAMOS IN STOCK.

Designation of Machine.	No. Lights 2,000 c. p. 10 amp. X	No. Lights 1,600 c. p. 8 amp. Y	No. Lights 1,300 c. p. 6 amp. Z	No. Lights 800 c. p. 4 amp.	Horse-Power at Pulley of Dynamo.	Width of Single Belt in Inches.	Belt Speed Required.	Weight of Dynamo.
C	.....	35	.....	.....	21.0	4	5,000 FEET PER MINUTE.	1,360
C	.....	.....	45	.....	21.0	4		1,360
C	.....	.....	.....	70	21.0	4½		1,360
H	40	.....	.....	.....	29.7	6		1,750
H	.....	50	.....	.....	30.0	6		1,750
H	.....	.....	64	.....	29.5	6		1,750
I	52	.....	.....	.....	38.0	8		2,290
I	.....	65	.....	.....	38.6	8		2,290
I	.....	.....	83	.....	38.0	8		2,290
J	64	.....	.....	.....	46.5	10		2,770
J	.....	80	.....	.....	47.1	10		2,770
K	75	.....	.....	.....	52.5	12		3,200

THE BURTON ELECTRIC HEATER,

FOR ELECTRIC RAILWAY CARS.

No Smoke! No Gases! Economy in Space!

Normal use of Current, THREE AMPERES.

"They are giving us and the public entire satisfaction."—Richmond, Va., U. P. Ry. Co.
"The heat is pleasant, sufficient and economical."—Marlborough, Mass., Street Ry. Co.

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THE BURTON ELECTRIC CO., RICHMOND, VA.

International Electrical Exhibition,

AT FRANKFORT-ON-MAIN,

From 15 May to 15 October, 1891.

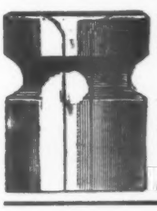
Application to be sent to the Committee (Mr. Leopold Sonnemann, Chairman), Frankfort-on-Main.

THE NATIONAL CARBON CO.

CLEVELAND, OHIO.

MANUFACTURERS OF

ELECTRIC LIGHT CARBONS AND BATTERY MATERIAL.



Porcelain Electrical Supplies and Specialties,

MANUFACTURED BY

EMPIRE CHINA WORKS,

144 & 156 Greene St., GREENPOINT, BROOKLYN, E. D., N. Y.

Our Ware is HARD PORCELAIN, the BODY and GLAZE IDENTICAL, and GUARANTEED NON-CONDUCTIVE for all ELECTRICAL PURPOSES.

All GENUINE INGOTS & MANUFACTURES BEAR OUR REG. TRADE MARKS

"Phosphor Bronze"

PHOSPHOR-BRONZE

INGOTS, CASTINGS & MANUFACTURES.

THE PHOSPHOR BRONZE SMELTING CO. LIMITED
512 ARCH ST. PHILADELPHIA PA. U.S.A.
ORIGINAL MANUFACTURERS OF PHOSPHOR-BRONZE IN THE UNITED STATES AND OWNERS OF THE U.S. PATENTS

THE

American Bell Telephone Company,

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30, 1877, No. 186,787.

The Transmission of Speech by all known forms of ELECTRIC SPEAKING TELEPHONES infringes the right secured to this Company by the above patents, and renders each individual user of telephones, not furnished by it or its licensees, responsible for such unlawful use, and all the consequences thereof and liable to suit therefor.

THE HOLTZER-CABOT ELECTRIC CO.,

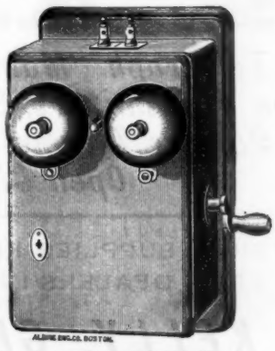
Manufacturers and Dealers in all Kinds of

ELECTRICAL APPARATUS.

Office and Warerooms: 111 ARCH STREET, BOSTON.

Factory: BROOKLINE, MASS.

Special Agencies: Baker, Balch & Co., Seattle, Wash.; Paul Seiler's Electric Works, San Francisco, Cal. Where a full line of our goods is carried in stock.

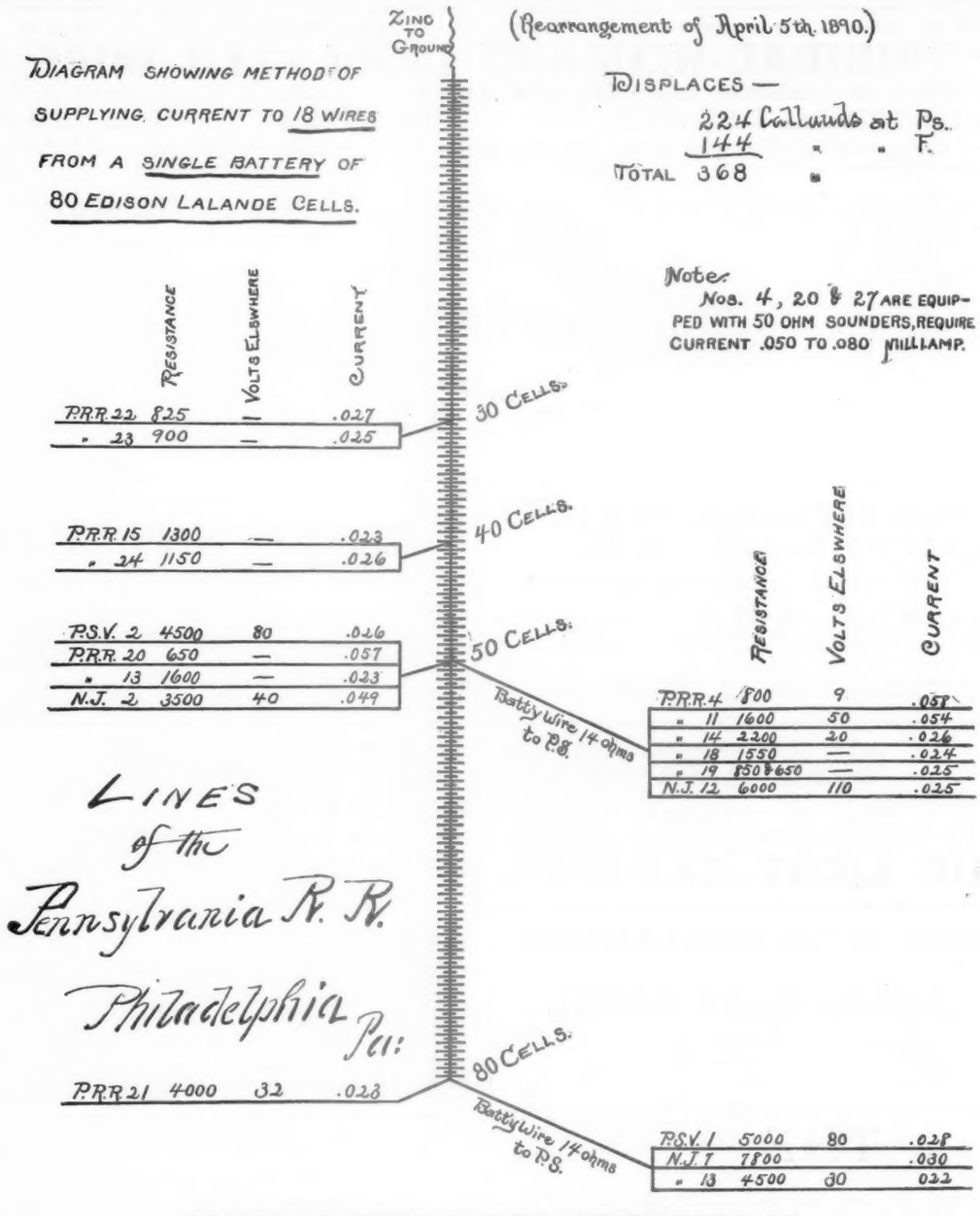


OUR SPECIALTY:
Standard and Pony Magneto Bells.

Enclose Business Card and Send for Illustrated Catalogue.

Standard and Pony Extension Bells.

THE NEW
EDISON-LALANDE BATTERY.


Zinc to Ground
(Rearrangement of April 5th 1890.)
Diagram showing method of supplying current to 18 wires from a single battery of 80 Edison Lalande Cells.
Displaces —
224 Callaunds at Ps.
144 " " F.
Total 368 "
Note.
Nos. 4, 20 & 27 are equipped with 50 ohm sounders, require current .050 to .080 milliamp.
Resistance
Volts Elsewhere
Current
30 Cells.
P.R.R. 22 825 — .027
" 23 900 — .025
40 Cells.
P.R.R. 15 1300 — .023
" 24 1150 — .026
50 Cells.
P.S.V. 2 4500 80 .046
P.R.R. 20 650 — .057
" 13 1600 — .023
N.J. 2 3500 40 .049
Batty Wire 14 ohms to P.S.
P.R.R. 4 800 9 .058
" 11 1600 50 .054
" 14 2200 20 .026
" 18 1550 — .024
" 19 850 & 650 — .025
N.J. 12 6000 110 .025
Lines of the Pennsylvania R. R. Philadelphia Pa:
80 Cells.
P.R.R. 21 4000 32 .028
Batty Wire 14 ohms to P.S.
P.S.V. 1 5000 80 .028
N.J. 7 7800 .030
" 13 4500 30 022

MANUFACTURED UNDER AUTHORITY OF

THOS. A. EDISON.

Primary Batteries for Telegraph "Mains" and "Locals," Electro-Motors, Electro-plating, Telephone Transmitters, Electro-Medical Instruments, Annunciators and Burglar Alarms, and all classes of Closed and Open Circuit Work.

ALL DEALERS IN ELECTRICAL SUPPLIES KEEP, OR SHOULD KEEP, THESE CELLS IN STOCK. IF UNABLE TO PURCHASE FROM DEALERS IN YOUR VICINITY, COMMUNICATE WITH

JAMES F. KELLY, GENERAL SALES AGENT,

19 DEY STREET, NEW YORK.

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CAPITAL $500,000. PAID IN.

SPECIALTIES:
Construction Complete Power Plants
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Compound & High Pressure.
"NONE SO GOOD, NONE TO EQUAL."

WALDO P. ADAMS, Gen Manager.

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NORTH EAST, PA.

ONLY MANUFACTURERS OF PURE COPPER TEMPERED FOR

BRUSH COPPER, COMMUTATOR BARS, COPPER WIRE, GEAR PINIONS, BEARINGS, TROLLEY WHEELS.

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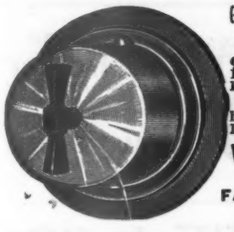
Forest City Electric Works

MANUFACTURERS OF

Cleveland's Electric Light Cut-outs

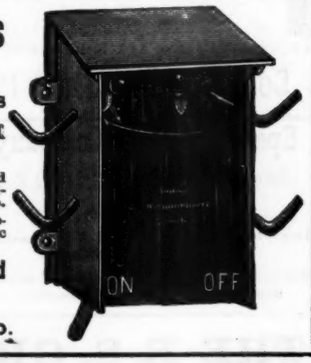


Gang Switches from 5 to 40 Amperes.

Quick make and Break uncontrolled by the Handle.

Correspondence Solicited with Electric Light Companies.

W. B. Cleveland
PROPRIETOR,
FACTORY,
CENEVA, O.



The Filling Hole in top Cap is covered with Snap Lever, which can not be displaced by jarring or shaking of machinery.

Shows oil dropping while machinery runs.

Powell's Patent "Signal" DYNAMO OILERS.

THE BEST IN THE WORLD.

Sight chamber is fitted with square window panes, which are secured by brass end plates, and can be removed for inspection, cleaning or repairs, at any time, while the machine is running.

MANUFACTURED BY
THE WM. POWELL CO.,
Nos. 50, 52 & 54 Plum St., CINCINNATI, O.

Please send for Prices and Discounts.

Shows flow of oil stopped when machinery stops.

FIG. 2.

Flow of oil can be instantly stopped or started, without changing degree of feed.

HOLMES, BOOTH & HAYDENS,

MANUFACTURERS OF

BARE AND INSULATED WIRE,

Underwriters' Copper Electric Light Line Wire, handsomely finished, highest conductivity. Copper Magnet Wire, Flexible Silk, Cotton and Worsted Cords for Incandescent Lighting. Round and Flat Copper Bars for Station Work. Insulated Iron Pressure Wire.

TRADE MARK "K.K."

PATENT "K. K." LINE WIRE

TRADE MARK "K.K."

For Electric Light, Electric Railways, Motors, Telegraph and Telephone Use.

Agents for the WASHINGTON CARBON CO.,

FACTORIES: WATERBURY, CONN.

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INTERIOR CONDUIT AND INSULATION COMPANY.

A New and Improved Method of Fitting Buildings with Insulated Tube Conduits to receive Wire for any Electrical System.

COMBINING ADVANTAGES OF

Safety, Durability, Economy, Accessibility, Convenience.

Samples, Price Lists, Catalogues and Instructions, Mailed on Application.

ADDRESS

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16 and 18 BROAD STREET, NEW YORK.

JOHN A. SEELY, President. JAMES A. TAYLOR, Treasurer and Secretary.

SEELY & TAYLOR MANUFACTURING CO.,

24 Cortlandt Street, New York City.

Seely's PATENT Copper Beveled Edge Sleeves AND Tee Connectors

USED FOR SPLICING AND BRANCHING FOR UNDERGROUND AND AERIAL CABLES AND HOUSE WIRING.

FIG. 1.

Fig. 1 represents Copper Tee used for branching from main cables, as shown in Fig. 2.

FIG. 2.

Fig. 3 represents a Copper Sleeve used for straight connections for continuation of cables.

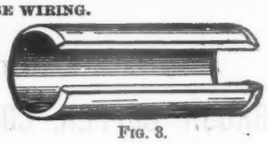


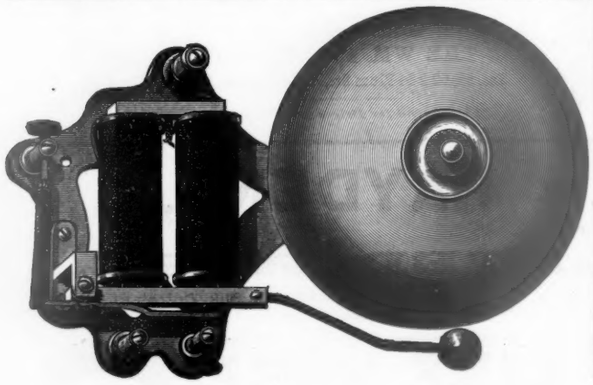
FIG. 3.

These sleeves are bevel edged, thereby preventing abrasion of insulation when placed over same.

THESE SLEEVES AND TEES ARE USED EXCLUSIVELY FOR ALL UNDERGROUND WORK IN NEW YORK CITY.

SEELY & TAYLOR MFG. CO., 24 Cortlandt Street and 19 Dey Street, New York City.

Manufacturers



H. E. & C. BAXTER,
18 Fulton Street, Brooklyn, E. D.

SperryElectric Company,
Factory 195-207 Canal Street, Chicago, Ill.

MANUFACTURERS OF THE

Improved Sperry High and Low Tension Systems of Arc Lighting,

Claiming the Highest Efficiency, Reliability and Durability. Perfect Regulation.

WELLINGTON
Belt Holder
The simplest, cheapest and handiest device in existence for shifting Dynamo Belts. Please write for circulars to
W. R. SANTLEY & CO.
WELLINGTON, O.

No more broken acid bottles, hence time, money and material are saved.

ECONOMIC FLUX BULB

For containing and conveniently applying liquid flux for all kinds of soldering. Always ready and will not spill acid.

It recommends itself to manufacturers of electrical apparatus, especially in the winding of armatures for dynamos and motors.

IT IS A BOON TO LINEMEN, PLUMBERS AND TINSMITHS.

Contracting companies will realize its merits by noting the saving of *Ten Months* acid supply per year for each workman; time consumed in hunting for old bottles and filling same not considered.

No waste at all; is conveniently carried, and can lay in any position without spilling one drop of acid.

$1.00. Sent by Mail, Postpaid, on receipt of Price. $1.00.

The Bulb is made of rubber. It contains a wick which is always moist or wet, and ready to supply acid in any quantity desired. *Gentle pressure* on the Bulb governs the flow of acid.

It is more convenient and economical than the use of rosin, and it is indispensable in any trade or industry where the soldering iron is used.

MANUFACTURED BY BOSTON WOVEN HOSE CO.,
No. 226 DEVONSHIRE STREET, BOSTON, MASS.

THE E. S. GREELEY & CO.,

Nos. 5 & 7 Dey St., New York

Manufacturers and Importers of and Dealers in

Telegraph, Telephone — AND — Electric Light Supplies

AGENTS FOR

Cleveland Arc Light Cut Outs & Gang Switches

Cleats, Rosettes, Moulding, Pins, Cross-Arms, Brackets. Insulating Tapes.

Rubber, Porcelain and Glass Insulators

WIRES OF ALL KINDS.

Silk & Cotton Covered Flexible Conducting Cord of various sizes for Incandescent Lighting.

Spikes, Pole Steps, Lag Screws, Drive Screws, Turn Buckles, Etc.

THE HEINE SAFETY BOILER CO.

PATENT SAFETY WATER TUBE STEAM BOILERS.

NO CAST IRON PARTS. ALL PLATE STEEL.

No contracted openings to drum, but full area of tubes carried out, thus assuring free circulation and dry steam. Adapted for all kinds of water and fuel. Manufactured both in the East and West. Send for Illustrated Catalogue.

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—OR TO—

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Risdon Iron Works.....San Francisco, Cal.
Stearns, Roger & Co.....3 Duff Block, Denver, Col.
R. M. Huston.....Room 169, 45 Broadway, New York
Jos. K. Rugg & Co..107 West Second St., Cincinnati, O.
H. E. Collins & Co.....34 Lewis Block, Pittsburgh, Pa.
Van Zile, MacCormack & Co.....Albany, N. Y.
L. Motesser.....34 St. Charles St., New Orleans, La.
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English, Morse & Co..1221 Union Ave., Kansas City, Mo.
Seeger & Guernsey Co.....City of Mexico, Mexico

AGENTS.

HAZAZER & STANLEY,
ELECTRICAL HOUSE FURNISHINGS,

32 and 34 FRANKFORT ST., NEW YORK.

T. W. NESS, Montreal, - - - - - - - Agent for Canada.
A. SECHRIST & CO., - - - - - - Agent for Denver, Colo.
LOUIS B. HETTY, 126 Eddy Street, - Agent for San Francisco, Cal.

MESSRS. HAZAZER & STANLEY, NEW YORK, June 9th, 1890.

GENTLEMEN: We have used your Dust Proof Iron Box Bells for the past five years and have always found them to give entire satisfaction and should be happy to recommend them to any one in search of a reliable bell.

Yours respectfully,
McCREERY & PRENDERGAST, Electrical Contractors,
986 Sixth Avenue, New York City.

THE STREET RAILWAY JOURNAL

Vol. VI. 113 Liberty St., New York. Monthly, $2.00 Per Year.

THE STREET RAILWAY JOURNAL, 113 Liberty Street, NEW YORK.

CONTENTS.

Each issue contains 180 pages or more, including 40 to 60 pages of reading matter and illustrations.

A Directory of Street Railways in the United States and Canada.

A Directory of Manufacturers of street railway appliances and materials.

Is the Best Advertising Medium through which to reach Street Railways.

JUST ISSUED FROM THE PRESS!
WHIPPLE'S
Electric, Gas and Street Railway
FINANCIAL REFERENCE
DIRECTORY
For 1890.

CONTENTS:

List of all Central Electric Light and Power Stations, with Capital Stock, Officers, Systems used, Capacity and Number of Lights in use, Steam Plants, Day Circuits, Kind of Wire and Belts used and Financial Standing.

List of all Isolated Electric Light Plants, with Number and Kind of Lights.

List of all Gas Companies, with Capital Stock, Officers, Price of Gas and Financial Standing, including all Gas Companies operating Electric Light Plants.

List of all Street Railway Companies, with Capital Stock, Officers, Miles of Track, Gauge, Kind of Rail, Number of Cars and Horses, Motive Power, if Electric, Cable or Steam, and Financial Standing.

List of all Telephone Exchanges and Licensed Companies, with Officers and Financial Standing.

Financial Standing of all Manufacturers, Dealers and Agents in the General Electrical World.

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HANDSOMELY PRINTED AND BOUND.

Sent express paid on receipt of $5; with Monthly Corrections, $6; with Confidential Rate Sheet, $10.

THE FRED H. WHIPPLE CO.,

NEW YORK OFFICE, TEMPLE COURT. DETROIT, MICH.

Electric Bells and all About Them.

BY S. R. BOTTONE.

A Practical Book for Practical Men.

WITH MORE THAN 100 ILLUSTRATIONS.

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Electrical Review,
13 PARK ROW,

P. O. Box 3329. NEW YORK.

JUST ISSUED.
BROWN'S DIRECTORY OF AMERICAN GAS COMPANIES.

GAS STATISTICS.

3D ISSUE.

CONTENTS.

Complete list of all Gas Companies in the United States and Canadas—Capital Stock—Bonded Debt—Officials (including names of purchasing agents of each company)—Population—Price of Gas—Number of Public Lights—Price obtained for same—Candle-Power.

List of Natural Gas Companies throughout the country.

Record of Gas Companies operating Electric Light Plants.

Officers and Members of all Gas Associations.

Explanation of various Water Gas processes and methods of operation.

THIS VOLUME HAS BEEN COMPILED FROM THOROUGHLY AUTHENTIC SOURCES, IS THE ONLY WORK OF THE KIND PUBLISHED, AND IS INVALUABLE TO ALL HAVING DEALINGS WITH GAS COMPANIES OF THE COUNTRY.

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W. L. SCOTT, President. J. F. PORTER, Vice-President. G. W. BRINK, Secretary.

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MANUFACTURERS' AGENTS AND DEALERS IN

ELECTRICAL MERCHANDISE OF EVERY DESCRIPTION,

403 NORTH EIGHTH STREET,

WRITE FOR QUOTATIONS. ST. LOUIS, MO.

FARADAY CARBON CO.,
ELECTRIC LIGHT CARBONS, PITTSBURGH, PA.

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DRILLS

Something New! One, two, three, and four spindle drills for light work.

The most useful patented improvement in drill presses for years is applied.

SENSITIVE

Spindles driven with single, endless belts. Large driving pulleys, tightener and variable speeds provided.

Over 1,000 in use. Buy the **latest** and **best**. Special machinery to order. Catalogue of fine tools free.

Dwight Slate Machine Co.

HARTFORD, CONN.

ROYCE & MAREAN,

DEALERS IN

ELECTRICAL APPARATUS,

Telegraph and Telephone Supplies,

No. 1408 Penna. Avenue,

Opp. Willard's Hotel. WASHINGTON, D. C.

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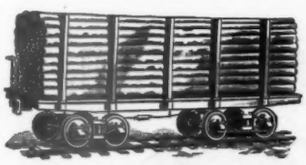

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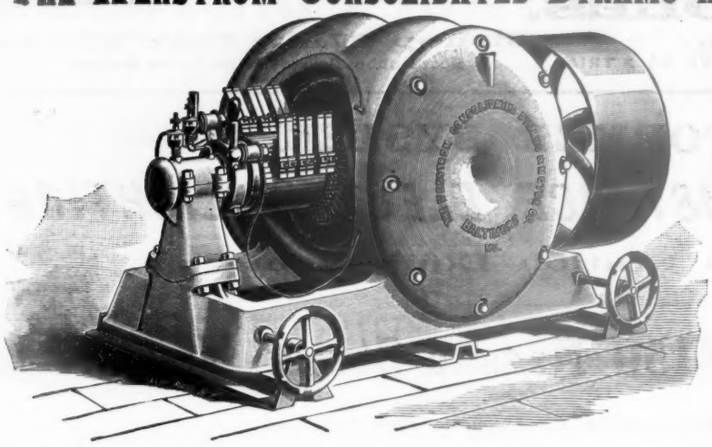

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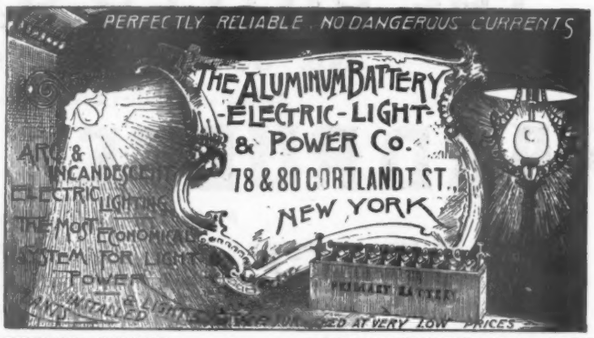

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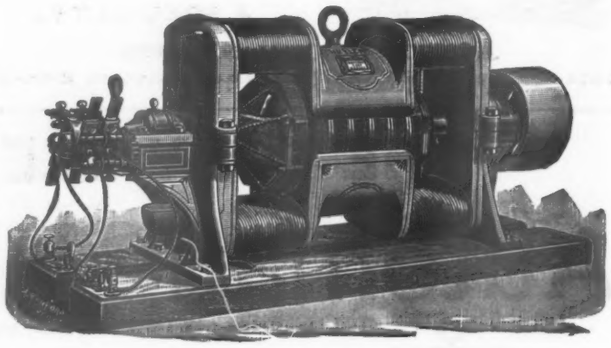

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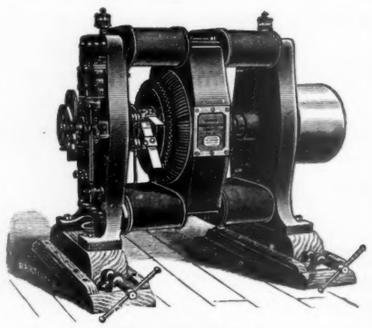

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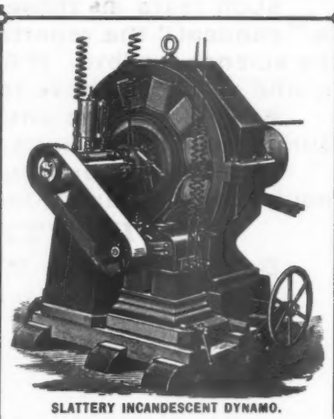

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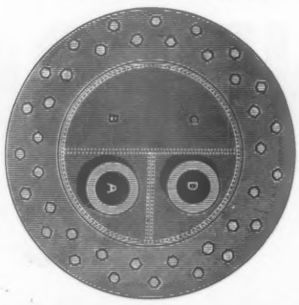

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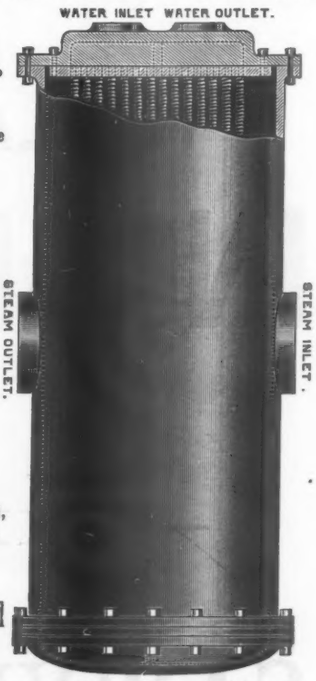

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